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DISEASES OF THE LARYNX. MATERIAL ABSTRACTED DURING THE YEAR 1938.

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PHYSIOLOGY OF THE LARYNX.

Function: Pressman¹ by means of motion picture film showed that the larynx has two chief functions:

1. To act as a passage for air.
2. To produce sound.

The first of these is not very complex. There is sufficient space to allow the passage of volumes of air adequate for our needs at rest; however, under certain conditions, such as singing or speaking, the area of the glottic chink at rest would prove inadequate. A larger lumen for the passage of air becomes necessary, which the larynx provides by an increased abduction of the vocal cord. The degree to which the cords can be spread apart for increased respiration varies in different individuals. The vocal cords when properly trained can undergo cycles of abduction and adduction at a speed greater than 16 cycles a second. They can, therefore, separate and forcibly approximate at a speed of over 1,000 separate and distinct contacts a minute.

The false vocal cords are neither remnants of vestigial organs nor functionless mucosal shelves serving no purpose; but, on the contrary, are important structures playing an active part in laryngeal physiology. The method by which they serve to protect the larynx from foodstuffs during swallowing, and how during deglutition they swept across the larynx, sealing it from above and presenting a barrier through which

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foreign matter could not pass, was very clearly brought out by means of the film.

The second function of the larynx: The production of sound is carried out almost entirely by the action of the true vocal cords. The author stated that the vibrations producing sound take place in large measure, or entirely, in the anterior two-thirds of the cords. The first principle utilized by the larynx in changing its tone: a simple tightening or increase in the tension of the cords as we ascend the scale. A second principle which the author brings out as a new conception is that of functional foreshortening. The vibrating string under fixed tension, if the vibrating length of this string is shortened the resulting tone will be higher. He states that this principle of foreshortening takes place in the larynx by a varying length of one cord, beginning posteriorly, coming into firm contact with, and dampening a corresponding length of the other, thus leaving only the anterior portions of the cords free to vibrate. In other words, functional foreshortening has taken place. The third means available to the larynx for elevating pitch: Given a fixed amount of escaping air under fixed pressure, the smaller orifice through which this air escapes, the higher is the resulting tone; therefore, as the cords come together in increasing lengths for purposes of dampening, as a secondary result the area between them becomes smaller and smaller, and as the air passes through this increasingly narrow orifice the resulting tone becomes higher and higher.

To sum up: 1. A tightening of the vocal cords. 2. A functional foreshortening by dampening of selected lengths of one cord against the other; and 3. a narrowing of the orifice between them, which automatically results from the foreshortening or dampening process.

Speech: Negus,² on the Evolution of the Speech Organs of Man, states that speech depends primarily on production of sound in the larynx. Sound produced by air blown through glottis: This compound sound is modified by resonators. His conclusions are: It can thus be seen from a comparative anatomic and physiologic study that man is in an advanced position in respect to his organs of speech. He has the potentiality for producing sounds of varying quality, character and intensity. His anatomic make-up does not permit him

to emulate many animals with greater vocal power in proportion to their size; but, even so, his voice can carry for long distances. A point to be emphasized again is that various factors have combined to bring into existence a mechanism well adapted for speech when the intelligence calls for its employment. To think that the larynx and its vocal cords have been evolved primarily for purposes of speech is incorrect. In this respect it is interesting to note that after removal of the larynx, speech may be carried on with success by expulsion of air from the gullet and upper esophagus.

EXAMINATION OF THE LARYNX.

Patterson,³ speaking on laryngeal symptoms in children, pointed out the history is important in diagnosis of laryngeal disease in children. Any child's larynx can be examined by the direct method.

Beatty,⁴ speaking on laryngeal diagnosis, states the primary function of the larynx is respiratory and protective, and the prevention of laryngeal disease by removal of irritating factors, when possible, is efficient prophylaxis. Recurrent or persistent benign tumors in the larynx of the adult patient are always to be considered serious.

Roentgen Ray Examinations of the Larynx: Important improvements have taken place to insure better Roentgen ray examinations of the larynx.

Canuyt and Gunsett⁵ note that Roentgenograms of the larynx taken by usual methods are not satisfactory, so they employ the method of Tomography or Planigraphy, in which the Roentgenograms are taken in different planes. With this method the authors state the laryngologist can study any particular area desired.

Waldapfel⁶ is of the opinion that the only way to exclude the interfering spinal column is by introducing the film between the larynx and spinal column; that is, into the hypopharynx, and then making a frontal exposure. Superficial anesthesia of the pharyngeal mucous membrane is necessary. Rethi employed this method more than 20 years ago. It is helpful, 1. in determining the downward extension of the processes of the vocal cords; 2. for the after-examination in cases of laryngeal operations; 3. the determination of the

length and extension of laryngeal stenosis and for physiologic studies.

Waldapfel⁷ again states that the larynx may be X-rayed several ways. The profile view gives the most useful results. The epiglottis and the three subdivisions of the larynx are definitely seen. The increase in the width of the shadow between the vertebrae and posterior wall of the larynx is of great value. If the profile view is not sufficient, he uses Rethi's anteroposterior technique. After cocainization of the hypopharynx, a small film is placed in the hypopharynx. This view eliminates the shadows of the vertebrae.

The use of radiopaque material is of importance as Bouchet and Huet⁸ have pointed out that frontal radiography of the larynx is possible with the aid of contrasting substances, particularly lipiodol. The method consists of injecting 20 to 30 cc. heavy lipiodol through the nasal tract. This injection is made after complete anesthesia of the larynx and hypopharynx, and with the aid of the fluoroscope, radiographs are thus obtained of the laryngeal fossae, sinus pyriformis, glossoepiglottic fossae. The authors think the pictures are better than the ordinary profile type.

Radiography of Intralaryngeal Epitheliomata: Baclesse and Leroux-Robert⁹ state that radiography of the larynx in profile has many interesting and useful applications in connection with the study of epitheliomata of the laryngopharynx; for instance, to follow changes in neoplasms during and after radiotherapy.

Also, Regules and Caubarrere¹⁰ describe the advantages of radiography in diagnosis in cancer of the larynx; the upper part by lateral production, the lower part by the method of tomography. Tomography reveals more clearly than any other diagnostic method the size, form and extent of subglottic cancer.

SYMPTOMATOLOGY.

Hoarseness: The Carpenters¹¹ divide the causes of chronic hoarseness into four groups: inflammation followed by hypertrophies and ulcerations, new growths, neuroses and paralysis. The physician should never treat chronic hoarseness unless he can identify its cause, nor should he prescribe for or dismiss a case of hoarseness until every resource in per-

fecting a diagnosis has been exhausted. Syphilis, tuberculosis, new growths and catarrhal inflammation are the most frequent causes of hoarseness in the adult. Hoarseness is the only early symptom of cancer of the intrinsic larynx. Catarrhal inflammation of the cords sometimes taxes one's ingenuity in locating its etiology, and not only is the help of the internist required but an astute laryngologist must exclude the nasal sinuses and the habits of the patient.

Le Jeune¹² also emphasizes its value by stating that hoarseness may well be defined as the danger signal of the larynx. Any case of hoarseness lasting over a period of two weeks deserves and should have a thorough examination with the laryngeal mirror, for it is only by such a procedure that an early diagnosis in cases of tuberculosis, syphilis, carcinoma and tumors of the larynx can be made. Hoarseness unaccompanied by pain, cough or discomfort is frequently ignored by the patient. The author lists many types of hoarseness: Papilloma in children, in the milder types of growth, improvement follows after two or three Roentgen ray exposures or surgical removal. The larynx should always be examined before thyroidectomies, as well as postoperative. It is deplorable that such a large percentage of cases of carcinoma of the larynx referred to the laryngologist are so far advanced that little hope for a cure can be offered. Can it be because the patient fails to realize the significance of persistent hoarseness, or has the general practitioner ignored the danger signal of the larynx?

The Importance of Hoarseness as an Early Symptom of Laryngeal Malignancy: Woodward¹³ advises, since approximately 95 per cent of laryngeal cancers are squamous-cell epitheliomas, hence they grow slowly, metastasize late and, most important of all, produce a very early symptom; namely, hoarseness, which should direct attention to the lesion while in the early stages, and since the only squamous epithelium in the larynx is on the upper border of the true cord, it can be readily seen by the use of the laryngeal mirror. Of 66 cases of tumor studied, 33, or 50 per cent, were cancer, so when nearly half of the cases of persistent hoarseness are cancer, the importance of this symptom cannot be overlooked.

Orton,¹⁴ in his series of 102 patients with cancer of the larynx operated on, hoarseness was present in 89 of the patients.

NONINFLAMMATORY DISEASES OF THE LARYNX.

Recurrent paralysis of the larynx following injection of tetanus antitoxin is cited by Neffson,¹⁵ who states, although rare, in serotherapy, it has been reported in about 100 cases by various authors. A search of the literature revealed three reports from France and one from Germany describing laryngeal paralysis following injection of tetanus antitoxin; one of these was bilateral abductors, which remained unimproved after five months. In the other cases the paralysis disappeared after five months. In all the cases the paralysis developed six to nine days after the injection. Besides the case reported by Imperatori,¹⁶ there have been no reports in American literature. Dr. Neffson's patient, who was 19 years of age, three days after injection of 1,500 units of tetanus antitoxin developed hoarseness, which increased so rapidly that within a few hours he could hardly talk. Examination at time of admittance: Complete paralysis of left cord with diminution of sensation on left side of larynx. The paralysis improved gradually, and completely disappeared three months after onset.

ACUTE INFLAMMATORY DISEASES.

Laryngeal Diphtheria and Tracheotomy: Napier¹⁷ reviews 2,528 cases of diphtheria. In 65 per cent of the laryngeal cases, croup was the only clinical manifestation. In 55 cases, or 25 per cent, of laryngeal diphtheria, tracheotomy was performed. The author states that the mortality rate is lowest when the larynx alone is involved. It is higher when the fauces are also affected, and is greatest when the infection has spread to the nasopharynx. He found that tracheotomy was more frequently essential in the last two forms, and advocates early tracheotomy in the advanced cases. The author is of the opinion that tracheotomy gives better results than intubation in the treatment of laryngeal diphtheria.

Salmon¹⁸ sums up briefly the whole subject of diphtheria by stating that it is well to remember the importance of early diagnosis; the giving of sufficient doses of antitoxin, and when more desperate measures seem necessary, unless careful nursing is possible, the choice of tracheotomy rather than intubation. But, after all, the best possible treatment for diphtheria is prevention. It would seem of no less importance than the requirement of silver nitrate being put into a child's eyes at

birth, and vaccination against smallpox, that the profession and the laity be either educated or required by law to see that every child by the time he is 1 year old, be immunized against diphtheria.

Acute Laryngotracheobronchitis: Richards¹⁹ states that acute fulminating laryngotracheobronchitis remains a serious respiratory infection in children; often erroneously diagnosed, the urgent need of its relief is not appreciated, and its mortality distressingly high. Pneumothorax, secondary to pulmonary emphysema, is a complication present more frequently than hitherto appreciated. Tracheotomy is still the ideal method of laryngeal obstruction, but the lower airways must, if necessary, be kept free from obstructive material by repeated bronchoscopies. Further trial of sulfanilamide is needed to establish its worth in this infection.

In acute streptococci infections of the throat, Davis,²⁰ under symptomatology, mentions the fulminant conditions, accompanied by edema involving the epiglottis and arytenoid cartilages. He also states streptococcic laryngitis is rare; recommends tracheotomy be done in edema of glottis.

In acute laryngeal obstruction, Flinn²¹ insists on an early rather than a delayed tracheotomy, a low rather than a high tracheotomy when symptoms point to severe laryngeal obstruction. Early and orderly tracheotomy is a relatively minor procedure and, when considered apart from the condition for which it is done, is attended with a mortality of not more than one-fifth of 1 per cent. Intubation is reserved for the minority of cases and for experienced and equipped operators.

Undulant Fever: Giuffrida²² reports three cases of laryngeal involvement from undulant fever. Two patients died and one recovered. Early administration of vaccine, in the author's opinion, is the best treatment as a prophylaxis.

ABSCESS OF THE EPIGLOTTIS.

Report of two cases by Coats, Shuster and Gordon²³ that presented many parallel phenomena, *viz.*: the sudden onset of dysphagia, the feeling of pain, constriction and tenderness in the lower pharynx, especially on attempting to swallow, the ability to phonate, the spontaneous rupture of the abscess

with immediate relief of symptoms in one and three days, respectively, the absence of any acute upper respiratory infection immediately prior to the involvement of the epiglottis, the absence of any allergic history (personal and family), the involvement of the epiglottis and no other structure, and the duration of the illness. Michel in 1878 termed this condition *angina epiglottidea arteria*, stating that the acute inflammatory process is confined to the anterior surface of the epiglottis, though the larynx may sometimes be affected to a slight extent. St. Clair Thomson feels that such an infection, by strict anatomical classification, belongs to the group of laryngeal inflammations, though clinically it is more practical to consider it with other acute septic diseases of the throat. This condition may be secondary to inflammatory states of the pharynx, faucial tonsils, lingual tonsils, perhaps the posterior sinuses, or may become primarily involved by septic infection, irritating fluids or improperly masticated food, so that a small sharp particle may abrade the surface of the epiglottis, permitting entrance of micro-organisms; inhalation of pungent vapors, foreign body, *ad infinitum*. As soon as the diagnosis was made, both cases were immediately hospitalized and meticulously observed. These cases can often be fatal, if improperly handled. The greatest fear is edema of larynx.

CHRONIC LARYNGITIS.

Simple Chronic Laryngitis: Clerf²⁴ states that simple chronic laryngitis is a common nonspecific inflammatory disease of the larynx. A majority of the predisposing and exciting etiologic factors are found outside of the larynx. Justify Kyle's dictum that laryngeal changes are a local manifestation of a systemic condition. The author goes into pathologic alterations. Treatment is directed toward relieving changes which interfere with normal laryngeal function and correction of course. "In summarizing, chronic laryngitis is a nonspecific inflammatory disease, the causes of which are many and varied. Treatment consists of employment of local measures and removal of the cause. Although the effects of local treatment are temporary, such treatment is important. Etiologic factors must be sought for in the patient's habits, occupation, environment and general health. Improper use of the voice, repeated attacks of acute laryngitis and disorders of the accessory nasal sinuses, the nose and the oropharynx are the most

important of these factors. The results of treatment are dependent on the finding of the cause and on its correction."

Syphilis: Rebattu and Mounier-Kuhn²⁵ bring to the attention of the profession in their article on the treatment of this disease one of the complications, which is dyspnea, and the question arises whether to tracheotomize or intubate.

CONTACT ULCER.

Thomas²⁶ says excessive use of the voice seems to be the chief etiological factor. Hoarseness or complete loss of voice at intervals over a period of weeks is usually noted. Cough and constant discomfort in the larynx and, later, loss of voice, pain on attempted phonation, and strangling and cough, worse at night, are also symptoms. We must make every effort to be correct when we make the diagnosis, since we have three such diseases as cancer, syphilis and tuberculosis to eliminate. Superficial ulcers, involving the posterior end of one or both cords, and common sense should lead one to consider the advisability of conservative treatment. Vocal rest is of first importance in treatment.

PERICHONDritis OF THE LARYNX.

Vincent's Infection: Wagers²⁷ brings out some interesting points in his case of Vincent's infection of the mouth, throat and larynx; *i.e.*, a period of more than five months elapsed between onset of illness and final eradication of mouth and throat infection. Most critical stage of disease not reached until between four and five weeks after onset. Leukopenia appeared long after general and local condition had improved. The prompt and undoubted value of neoarsphenamine, given intravenously, in overcoming the Vincent's infection. The supportive value of blood transfusions during and after the period of the most devastating effects of the disease. Finally, the very favorable response of the leukopenia to pentnucleotide.

Tuberculosis: Brieger and Pagel²⁸ report four cases in which they thought the lesions of the larynx were of primary origin. Later, however, three of the four cases showed pulmonary lesions; the fourth case on postmortem examination showed pulmonary invasion.

Lukens²⁹ strongly advocates routine examination of larynx in all tuberculosis cases, for in the early stages there are few symptoms except slight cough due to irritation and the gradual onset of hoarseness; by the time dysphagia has developed there is little hope of cure or relief. A progressing laryngeal lesion has an unfavorable effect on the pulmonary lesions. Vocal rest is of value.

Cod liver oil for local treatment of tubercular laryngitis has been advocated by Banyai.³⁰ "The laryngeal applications of cod liver oil were all in adults; 91 patients under observation from two months to one and one-half years; oil pneumonia did not occur. The author stated, therefore, that prolonged use of cod liver oil spray to larynx is not likely to cause oil pneumonia in adults. The treatment consists of spraying the larynx by means of ordinary atomizer t.i.v. with warm oil, after meals. The change in the laryngeal findings was striking as the treatment progressed. In his series of 91 patients, 24, or 26.3 per cent, remained unimproved; of these, eight died during course of treatment. Forty-two, or 46.2 per cent, improved subjectively and objectively, and 25, or 27.5 per cent, healed. The evidences of symptomatic relief, such as elimination of pain, dysphagia and irritation in the throat, diminution of the cough, and easier expectoration, were promptly noticeable. Restoration of normal voice, better sleep and general improvement accompanied the objective manifestations of healing."

Presdescu-Rion³¹ give their experience during the past 25 years with the galvanocautery, which they believe is the best form of treatment for laryngeal tuberculosis, but requires caution. Many successful results are on record. There are others which have been disastrous and have converted enthusiasm into despair. In order to lessen the possible catastrophies following galvanocauterization, the authors use the sedimentation test as a control. The relative speed of the sedimentation of the red cells of the blood is a criterion of tissue destruction.

To sum up, Dworetzky³² points out the following in Modern Concepts of Laryngeal Tuberculosis: 1. Pulmonary tuberculosis is conveniently grouped in two types: predominately bronchopulmonary and hematogenous. 2. Tuberculosis of the larynx is nearly always secondary to pulmonary tuberculosis. 3. In the bronchopulmonary cases, about 75 per cent of all

cases of pulmonary tuberculosis, tuberculosis of the larynx occurs mainly through surface infection some time after the development of an active pulmonary tuberculosis. 4. In the hematogenous pulmonary cases, about 25 per cent of all pulmonary tuberculosis, the larynx becomes involved by way of the blood stream and appears either simultaneously or soon after the active dissemination of the lungs. 5. A lymphogenic route probably exists but is difficult to prove. 6. Tuberculosis of the larynx can conveniently be classified in four clinical types: peracute, acute, subacute and chronic. 7. The peracute and acute types occur mostly in hematogenous pulmonary tuberculosis. 8. The subacute and chronic types occur chiefly in the bronchopulmonary cases. 9. The incidence of laryngeal tuberculosis is much diminished (from 25.6 per cent to 14.6 per cent) in all cases of pulmonary tuberculosis, mainly because of the application of collapse therapy, but is still very high (80 per cent) in hematogenous tuberculosis. 10. The prognosis is invariably hopeless in the peracute cases, while in all others it depends entirely on the outcome of the pulmonary lesion. Where the pulmonary lesion improves, the larynx improves also. 11. Therapy should be directed mainly at the pulmonary lesion in a most thorough manner. 12. Laryngeal tuberculosis in bronchopulmonary cases successfully treated by collapse therapy presents a good prognosis. 13. In peracute cases the treatment of the larynx is palliative. 14. Cases receiving collapse therapy will need very little, if any, local treatment. 15. In all the other clinical types where collapse therapy cannot be employed, vocal rest, cautery and chaulmoogra oil are our best remedial agents.

Radium and Roentgen Ray Therapy: In Tracheal Stenosis from Roentgen Therapy, Clerf and Putney³³ warn the profession concerning the complications resulting from intense irradiation in the treatment of carcinoma of the larynx. They report extensive perichondritis and gangrene of the laryngeal cartilages with stenosis following X-ray treatments for exophthalmic goitre. It must be emphasized that powerful therapeutic agents are potential sources of danger. If irradiation has a place in the treatment of exophthalmic goitre, can proper precautions be exercised to avoid trophic reactions which are disabling and may terminate fatally?

Watson-Williams³⁴ reported a case of cicatricial stenosis of the larynx following sarcoma of the trachea treated by radium

in 1931. One year later resulted in complete stenosis of larynx at level of cords. This condition treated by the author, and reports at present time (1938) that the patient's general health is excellent; rides bicycle every day, plays tennis; the voice is a loud whisper.

ACUTE AND CHRONIC LARYNGEAL STENOSIS.

Acute Obstructive Laryngeal Dyspnea: Weinstein's³⁵ summary and conclusions are as follows: 1. Three cases have been described, each of which presented the symptom of obstructive laryngeal dyspnea, but in each of which the fundamental etiology was different; namely, *a.* hypopharyngeal foreign body in an infant, with occlusion of the laryngeal lumen; *b.* streptococcic laryngotracheitis in a child with edema of the larynx; and *c.* edema of the larynx complicating agranulocytic angina following sulfanilamide therapy. 2. Every practitioner should be familiar with the cardinal signs and symptoms of obstructive laryngeal dyspnea. 3. Of all emergencies, obstructive laryngeal dyspnea is perhaps second to none. It often requires emergency relief and every physician should be equipped and capable to administer such relief.

Helium in Cases of Obstructive Lesions: Kernan and Barach,³⁶ in cases of obstructive lesions in the trachea and larynx, bring out the advantages of mixture of helium and oxygen over oxygen alone.

Explanation of the Respiratory Failure Sometimes Occurring After a Successful Tracheotomy: Negus³⁷ states the respiratory centre depends normally upon the concentration of hydrogen ions in the blood reaching it, and this in turn depends upon the functional activity of the lungs. The larynx normally takes an important part in regulating the respiratory exchanges. The author recommends very strongly that at the time of operation on any cases of laryngeal stenosis a cylinder of CO₂ should always be at hand, and if breathing becomes shallow or of Cheyne Stokes type, the patient should be made to inhale the gas. This respiratory stimulant should remain at the patient's bedside for some hours. The advisability of estimating the alkali content in such cases, if there is doubt as to the degree of obstruction, is emphasized. Every patient with sufficient laryngeal or tracheal stenosis to cause any audible stridor should be advised that he is in the danger

zone. If the stridor is noticeable while resting, the question of tracheotomy is considered. If it is audible when asleep, the operation is urgently required.

Diphtheritic Stenosis of Larynx: Myers³⁸ credits intubation as a means of saving many lives, but believes that in the occasional case the intubation tube may have been a factor in the production of an irritation from which a stenosis is made by opposing ulcerated edges. The author reports a case in which the child is cured by means of a connected silver bead in-lying bougie. A year of peroral laryngeal treatment obviated the necessity of splitting the larynx.

Laryngotracheal Stenosis Caused by Goitres: Prof. Van Den Wildenberg³⁹ calls attention to the dangers associated with latent tracheal stenosis due to a thyroid compression. Diagnosis is aided by investigating the presence of dyspnea caused by effort. The author cites a case of a young medical man whose only symptom was dyspnea on riding his bicycle. The author also states these cases are subjected to operation too late. These large retrosternal thyroids can exert considerable compression on the trachea and larynx. He draws attention to the effects of ill advised radiotherapy which is also prejudicial to surgical interference.

Use of the Hyoid Bone as a Graft in Laryngeal Stenosis: With the increased number of auto accidents there will unquestionably be trauma to the larynx in one way or another. Looper⁴⁰ describes fully the procedure which is best adapted to treatment in adults in the use of the hyoid bone as a graft in laryngeal stenosis. The operation is proposed as a method of utilizing the hyoid bone as a graft in treatment of laryngeal stenosis in certain cases. The principle depends on embedding the left end of the attached hyoid bone between the incised thyroid cartilage, to act as a wedge in enlarging contractures and deformities of the larynx and to permit a better airway. This firm, bony graft acts as a splint to weakened and deformed cartilage. The ease with which the hyoid bone can be exposed, detached and rotated makes the procedure practical. A living, attached and accessible graft, with the blood supply to its upper part undisturbed, has advantages over a foreign embedded graft, such as cartilage from a rib, an ear or some other part of the body. The operation is an improvement for treatment in certain cases of laryngeal stenosis

resulting from injury to adults. It has not been tried on children.

Whereas Miodonoski⁴¹ describes an operation for the treatment of laryngeal stenosis or atresia in children, it is a development of the method of Langenbeck and Uchermann. The excision of scar tissue is carried out under direct vision by means of the Haslinger directoscope.

Surgical Therapy of Chronic Stenosis of Larynx: Sercer⁴² states there is no general rule for treatment of all laryngeal stenosis, and in a number of cases a cicatrized tracheostomy without a cannula is all that can be accomplished.

Treatment of Chronic Stenosis of the Larynx, with Special Reference to Skin Grafting: Negus⁴³ describes the various methods as repeated bouginage, division of webs with cautery or knife. Temporary or permanent tracheotomy is discussed, and he calls attention that tracheotomy may be called for in stenosis of the larynx due to double abductor paralysis. High tracheotomy has been done and is the reason of the stenosis, and, of course, the first thing to do here is a low tracheotomy. Operations to shift the positions of the vocal cords have been made, but he does not advocate their use. Nerve anastomosis has not been satisfactory. Schmiegelow's method has been tried. Laryngostomy with prolonged packing is tedious and painful. The author's method of choice is that of skin grafting; the same method has been recommended by Arbuckle and Figi.

Schmiegelow⁴⁴ gives his experience on the surgical treatment of laryngeal stenosis by means of hard India rubber tubing. He speaks of a group of patients in whom laryngeal and tracheal stenosis is refractory to various treatments, which, although continued for years, do not cure the patients who suffer from extensive fibrous synechiae of the walls of the larynx or trachea. The author does not believe that where the larynx is involved, and there is stenosis and ankylosis of the arytenoid region, that the patient will be condemned to wearing a permanent tube. The author feels, now, that he has the right to claim that every patient with chronic stenosis due to cicatrization of the soft parts, syphilitic perichondritis, ulceration, postoperative lesions, diaphragmatic formation, synechiae and similar pathological processes, can be cured by proper dilatation by means of his India rubber tubing. The

larynx and the trachea must be examined directly and indirectly with the utmost care in order to properly ascertain the degree, shape and nature of the stenosis. In children this examination is best done under deep anesthesia. He then begins his treatment by doing a low tracheotomy, and then waits several months before doing a laryngostomy and inserting the proper size rubber tube, which is firmly fixed in the stenosis in such a way that the dilatation can continue uninterrupted for weeks and months without being changed and without any inconvenience to the patient. He does not, however, like to do this, or begin treatment on children under 5 years of age. The fixation of the tubing is performed translaryngeally by means of silver wire passed from side to side through the soft parts of the neck, thyroid cartilage and tubing. The upper end of the tubing must be above the vocal cords. The tubing may remain for weeks, or even months, before it is removed from above through the mouth by direct laryngoscopy. It may be necessary to repeat this procedure, using larger tubing. The advantage of this treatment, the author states, is the short period of time necessary for treatment and the few hospital days necessary.

PARALYSIS OF THE LARYNX.

Flottes⁴⁵ states that in the absence of extensive local manifestations in the neck and chest, the bilateral recurrent paralyses are always central in origin.

Some Clinical Aspects of Vocal Cord Inaction: Tilley⁴⁶ asks two questions concerning this subject; the first, what is the intimate neuropathology of vocal cord paralysis when caused by: *a.* A local lesion involving the extracranial course of a recurrent laryngeal nerve; and *b.* blood-borne bacterial toxins or chemical poisons. In the first category the author places aneurysm as an example which causes degenerative atrophic changes. In the second category, those of circulatory poisons, peripheral neuritis seems to be the essential pathology of the paralysis. In a series of 18 cases reported, the author found that the left cord was more frequently paralyzed than the right.

Surgical Treatment of Vocal Cords in Paralysis of Recurrent Nerves: Luscher⁴⁷ points out that the bilateral median position of vocal cords, resulting from bilateral paralysis of

recurrent nerve, leads sooner or later to a severe laryngeal stenosis, so that tracheotomy cannot be avoided. All conservative methods of vocal and respiratory exercises should be tried before surgical measures are resorted to; moreover, surgical injuries to the recurrent nerve in strumectomies often improve spontaneously in the course of months, or even years, so that the glottis becomes again sufficiently wide; however, with rare exceptions the final status is reached after one or two years. Wittmaack developed a surgical method which deliberately induces the lowering of one of the vocal cords. In two cases he found Wittmaack's operation a simple and reliable method for the correction of stenosis of the glottis in case of bilateral paralysis of the recurrent nerve with median position of the vocal cords. He would refrain from performing it only if the patient insists on an absolutely normal and clear voice.

BENIGN TUMORS OF THE LARYNX.

New and Erich⁴⁸ cover the subject in a most comprehensive manner. Tumors of a benign nature do not occur frequently in the larynx. One must interpret any abnormal mass of tissue in the larynx as a benign tumor, providing that it lacks infiltrative qualities and the power to metastasize, characteristic of a malignant lesion. No classification of benign laryngeal tumors is altogether satisfactory from a clinical standpoint, nor entirely possible from a pathological point of view. Some sort of grouping is necessary for study. They divide them into tumors of epithelial origin; *i.e.*, adenomas and papillomas. Tumors of connective tissue origin: Fibromas, neurofibromas, fibrolipomas, chondromas and osteochondromas, angiomas, myxomas, cysts. Nonneoplastic tumors: Inflammatory, xanthomas, amyloid, epithelial hyperplasia and leukoplakia, prolapse of the ventricle. *Etiologically*, many hypotheses have been advanced, but their actual cause is still unknown. Chronic inflammation, no doubt, is a factor. Their youngest patient was age 11 weeks, and the oldest, age 76 years.

Pathology: Benign tumors are composed of well differentiated cells; they never metastasize and displace tissue rather than infiltrate. Each one of the benign tumors is described histologically. Prolapse of ventricle consists of a displacement of the mucous membranes of the laryngeal ventricle in which

the mucosa protrudes into the lumen of the larynx between true and false vocal cords.

Situations: Site of predilection of benign tumors of larynx is the vocal cords. Multiple papilloma excepted.

Symptoms: No characteristic symptoms are diagnostic of benign tumors. Hoarseness is the most constant one. The most serious one is dyspnea, necessitating tracheotomy in some cases.

Diagnosis: Thorough history, Roentgenograms and complete work-up, including histological study, to differentiate them from malignant tumors, tuberculomas, syphilomas, acromegaly, blastomycosis and torulosis.

Treatment is based on size, position and nature of growth, and on the age and general condition of patient. They use suspension apparatus mostly in their removal, either by forceps or electrocoagulation. In large tumors, thyrotomy or pharyngotomy is necessary for exposure. In general, radium and Roentgen rays have little place in treatment. It is a most complete paper covering the subject, and accompanied by eight tables, 19 photographs and 18 microphotographs.

Tumors of the Larynx as Visualized by Suspension Laryngoscopy: LeJeune⁴⁹ states that too much stress cannot be given to the importance of early diagnosis. For exposure of the larynx, the suspension laryngoscope is the instrument of choice. Benign growths should be accurately and completely removed, with as little trauma and sacrifice of normal tissue as possible. The vast majority of vocal nodules will clear up with vocal rest. In properly selected cases, intrinsic carcinomas are amenable to endolaryngeal surgery or to laryngofissure. In the truly extrinsic types of carcinomas, which have not advanced too far, only radical surgery will give any successful results.

Freedman,⁵⁰ in his summary, points out that the function of the larynx is not primarily that of phonation, but that of an inlet for the purpose of respiration. The sacculus in man is the vestigial homologue of the ventricular air sac of the higher apes and other animals. The function of these air sacs is respiratory. They are not resonance chambers, as was formerly supposed. The importance of realizing the abundance of mucous and serous glands surrounding and

discharging into the sacculus and ventricle is emphasized. Tuberculosis, papillomas and cancer may arise from ventricle and sacculus more frequently than supposed. A pyocele of a ventricular air sac of the larynx is described; one of prolapse of sacculus, and a laryngocele. These lesions must not be confused with branchiogenic cyst or cyst of the thyroglossal duct. Clinically, cyst of the thyroglossal duct is always in median line of neck. Branchial cyst is situated laterally in the region of the ala of hyoid bone, in the same location as laryngocele and pyocele. Laryngocele is filled with air and increases with crying or exertion. Pyocele of larynx is extremely rare. Roentgen ray may be of assistance after injection of iodized oil.

Hogg⁵¹ reports prolapse of both ventricles of Morgagni. Patient complained of hoarseness for two months, with no previous history of throat trouble. The patient has, however, been using his voice by much singing for about seven years. On laryngoscopy was seen a large polypoid swelling emerging from the right laryngeal ventricle; a similar but smaller tumor was present on the left side.

Neville⁵² reports a case of a cyst with displacement of the sacculus in a patient who had had hoarseness off and on for eight weeks; voice at times a whisper, other times hoarse. Just before admittance to the hospital his breathing was affected. No cough. Indirect laryngoscopy showed a polypoid mass hanging over left vocal cord. Later, a tracheotomy was done, followed by laryngostomy; this revealed a cyst full of milky fluid with its base in left ventricle. The author says this tumor may be grouped as an eversion of the ventricle and prolapse of the sacculus.

Zollner⁵³ presents a case in which diagnosis was difficult. In discussing the pathogenesis, the author suggests that the protrusion of the laryngeal sacculus resulted from infection of the sacculus with tuberculosis.

Simpson⁵⁴ states laryngocele has its origin from a dilated ventricle of Morgagni. This sac may be either intralaryngeal or extralaryngeal, or a combination of both, called a mixed type. Etiological factors: singing, horn-blowing, or glass-blowing, weight-lifting, vomiting, childbirth and cough. The author removed the laryngocele by external operation under local anesthesia. The sac contained a small amount of straw-colored fluid and air; the walls of the sac were very thick.

Robb⁵⁵ reports a case of laryngeal varix of the vocal cord for the purpose of re-defining the condition and drawing the attention of the profession to a lesion which is of considerable importance in industrial areas.

Two cases of myxofibroma of the larynx, because of their rarity, are reported by Weinstein⁵⁶ for recordal purposes.

Koch⁵⁷ reports 22 cases of laryngeal papillomatosis and classifies them in three groups: 1. Those in which Roentgen ray therapy is used without previous surgical intervention. 2. Those in which irradiation was employed on account of lapse after unsuccessful operation. 3. Those in which irradiation was employed after total surgical removal. The author favors this group.

Foster,⁵⁸ on the treatment of laryngeal papillomatosis, expresses the opinion that most, if not all, primary papillomas in children are amenable to low voltage, mild radiotherapy. The author stated that he had observed no good effects from the use of radiotherapy in treatment of papilloma in adults.

CANCER OF THE LARYNX.

There is an enormous amount of material on this subject; surgery, electrocoagulation, radium and Roentgen therapy, all play a part in the cure of this dreaded disease. We have not as yet reached the point where we can speak definitely as to surgery or irradiation, or both. As the articles abstracted will show, it is the individual opinion and experience of the operators, bearing in mind the site, grade, general condition of patient and after-care that means success or failure. The main thought is the cure of cancer, whether it is by surgery, irradiation, electrocoagulation, diathermy or a combination of these.

Concerning cancer, the Jacksons⁵⁹ ask five questions: 1. Is the physician justified in limiting the use of irradiation to cases in which operation is contraindicated? They feel that we should limit irradiation to the class of patients unsuitable for operation, either surgically or bad operative risk.

2. Where shall the line be drawn between cases for operation and cases for irradiation? If surgically operable, everything else taken into consideration (as to site and size of growth, grading, general condition of patient), the patient should be operated on by one of four methods.

3. What is the bearing of the degree of malignancy on the choice between operation and irradiation? *a.* They deem laryngofissure advisable for every small early growth anywhere in the intrinsic area in a patient free from general organic disease, regardless of the degree of malignant aggressiveness. *b.* For the advanced but still intrinsic growth of grade one or two in a patient free from other organic disease, they advise laryngectomy. For grade three or four, would prefer irradiation. *c.* For intrinsic growth with glandular metastasis we deem irradiation, regardless of grading.

4. Is it justifiable to do a laryngectomy for a small malignant growth in the anterior commissure? They say that, in their opinion, this procedure is perfectly justifiable and proper if the surgeon's experience leads him to believe that in performing it he is acting for the best interest of the patient. Only too often what looks in the mirror like a small growth is found on direct laryngoscopic examination to be so extensive as to exclude all hope of adequate removal by laryngofissure.

5. In view of the later improvements in the technique of irradiation, is the surgeon not justified in doing fewer laryngectomies? They say that the greatly increased efficiency of irradiation indicates that laryngectomy should be limited to good surgical subjects of general expectancy.

Indications for Different Types of Treatment of Malignant Disease of the Larynx: Imperatori⁹⁰ gives the indication for thyrotomy of laryngofissure: 1. A unilateral cordal growth located anterior to vocal processes and involving not much, if any, of the anterior commissure.

2. Histological grading of one or two by Broder's classification, squamous-cell carcinoma in adult.

3. Slight or no loss of mobility of the cord.

4. No adenopathy.

5. Previous clinical course and individual history.

In laryngectomy: 1. An intrinsic lesion of the larynx of such size, location and involvement of the structures that the operations of thyrotomy would be insufficient. No palpable lymph nodes.

2. A bilateral anterior located lesion in certain cases. He says this is a borderline case and it must be dealt with individually. A thyrotomy may result in a cure. All posterior lesions demand total extirpation.

3. Unsuccessful irradiation accompanied by perichondritis and necrosis of the framework of the larynx. Life may be prolonged for a period of from one to two years by laryngectomy.

4. Extrinsic lesions of the larynx. This condition, unfortunately, rarely yields to any known method.

Indications for Irradiation: Method of choice is that followed by Coutard. Careful consideration should be given to the degree of stenosis before one proceeds with irradiation.

1. Basal-cell growth.
2. An epithelioma or a noninfiltrated cord.
3. Growth in epiglottis or glossoepiglottic folds.
4. An inoperable extrinsic growth, evidenced by enlarged lymph nodes; postcricoid growth.
5. Irradiation may be used also after thyrotomy or laryngectomy.

Schall⁶¹ states that of all the agencies proposed for the combating of cancer, but two have consistently proved of value — surgery and radiation.

Laryngofissure has in its favor the following facts: 1. It is performed under local anesthesia. 2. The operative mortality is approximately 1 per cent. 3. The hospital stay averages one week. 4. There is frequent regeneration of the vocal cord, with complete return of the voice. 5. Five-year cures are obtained in 82 per cent of the cases.

The indications for laryngectomy are: 1. An intrinsic carcinoma of the larynx — grade one or two — of sufficient extension to make its operative cure by laryngofissure questionable; 2. involvement of the muscles or cartilages as evidenced by cord fixation or perforation of the cricothyroid membrane; 3. involvement of the posterior commissure; 4. subglottic extension with posterior commissure involvement.

Conclusions: The operation of laryngectomy is still the treatment of choice in an extensive intrinsic carcinoma —

grade one or two—of the larynx. The laryngectomized patient is not a social outcast, nor in most cases is he an economic burden.

Woodward¹³ gives the reasons why cancer of the larynx is curable in a large majority of instances, even in many extrinsic cases. Early growth can be completely removed by simple laryngofissure and local excision, which leaves a good speaking voice. In more extensive cases, complete laryngectomy is necessary, and in many instances the patient can acquire a good buccal voice. Avertin anesthesia has greatly aided the surgeon in his work and is a factor in preventing postoperative pulmonary complications. In the extrinsic cases, as well as intrinsic, the grading of the tumors is most important. Grade one, most amenable to surgery; grade two, most radiosensitive. In grades two and three the best method is selected according to each case. Electrothermic current is most important in certain cases, also radon seeds. Probably the most important method of treatment in the extrinsic type is by means of the fractional dose method of Coutard. Then, again, a combination of these methods may be necessary.

Palmer⁰² stresses the lack of motion pictures in the field of otolaryngology. He reviews one on laryngofissure for removal of intrinsic epithelioma of the larynx, mentioning that this operation can be used only in selected cases.

Kernan⁰³ states that in making the decision for the choice between radiotherapy and surgical treatment of carcinoma of the larynx, it must be remembered that we do not yet know how durable is X-ray's cure; and if recurrence comes there is no resource left. Intralaryngeal removal of carcinoma is possible, but it is not to be recommended, because it submits the patient to too great a risk. The surgeon's choice must be between excision through a laryngofissure or a total laryngectomy.

Klepper⁰⁴ advocates the principle of "let the form of operation suit the circumstances," and reports a case of modified hemilaryngectomy, an operation which he feels does not receive the consideration it should.

In the treatment of laryngeal cancer, Kramer⁰⁵ points out the following: 1. Highly differentiated squamous-cell carcinoma responds less favorably to Roentgen therapy than to

surgery. If extent or site of origin of the lesion favors use of Roentgen therapy, the cytology is not, then, a discouraging factor.

2. Surgery and radiotherapy offer approximately equal prospects in patients with freely moving vocal cords. But if thyrotomy or partial laryngectomy can be utilized, they should be the procedure of choice because of the shorter convalescence, more comfortable postoperative course, and greater economy to the patient.

3. Limited false cord, ventricular, aryepiglottic and epiglottic lesions respond well to Roentgen therapy and unless an operation, such as thyrotomy or epiglottidectomy, is indicated, fractional radiation is preferable to surgery.

4. Fixation of the cords indicates the use of surgery. But if extralaryngeal conditions intervene, Roentgen therapy offers some prospects of cure. When fixation is combined with extensive disease, Roentgen therapy and laryngectomy yield about the same results. If glands are present in addition, radiation is preferable to surgery.

5. Subglottic lesions respond better to surgery than to radiotherapy.

6. In cases of doubt as to the results of operation, Roentgen therapy should be employed as soon as the wound has healed.

Alonso⁹⁶ gives a resumé of his work, based on 270 cases since 1918. Of the total 270 cases, two-thirds have been treated by surgery, usually alone, but sometimes followed by radium or Roentgen therapy. The remainder were treated by some form of irradiation. The author stated that in old people with cancer, if the general condition rendered the operation dangerous, Roentgen therapy should be employed. He also divides his cases into three classes: 1. Epithelioma of the glottis confined to one side, anteriorly or with slight invasion of the anterior commissure, is treated by laryngofissure. 2. Epiglottis and aryepiglottic folds are treated by transverse subhyoid pharyngotomy. 3. Glottic or subglottic cancer, too extensive, or in cancer of the epiglottis invading the larynx, total laryngectomy is done in two stages. His operative mortality, 3.5 per cent, and survival rate after three years over 50 per cent. With radium he has only had one permanently good result in 25 or 30 cases. Speaking of treatment by Roent-

gen therapy, he says the percentage of cures is less than by surgery; but, on the other hand, the cures are obtained without mutilation. About 20 per cent of the cases treated by Roentgen therapy alone have cured, although the author does not state the length of time.

Laryngectomy, traced from its development through the years by Zinn,⁶⁷ proves that surgery has been the treatment of choice in cases of carcinoma of the larynx, provided diagnosis is made in time. Clerf^{67a} has pointed out that the patient, the general practitioner and the laryngologist must co-operate if the number of inoperable cases of cancer of the larynx is to be decreased. Zinn cites 25 cases; two died within three weeks, three had recurrence, three died from other causes, 17 living and well.

Looper⁶⁸ summarizes as follows: 1. The surgical removal of cancer still continues to be the most satisfactory method of treatment of this disease. 2. Successful surgery depends a great deal upon getting at the patient as soon as possible after the infection has started. 3. The importance of the early diagnosis of cancer should be stressed at every opportunity. 4. In about 20 per cent of early cases the conservative operation of laryngofissure can be used. Cures in these cases are reported as from 80 to 85 per cent. 5. Laryngectomy is a safe surgical procedure when properly performed and compares favorably with other surgical operations. The mortality is from 1 to 2 per cent. It is to be recommended where laryngofissure cannot be performed.

Crowe and Broyles⁶⁹ say there are only two methods of treatment. One is irradiation with Roentgen rays or radium, and this only in inoperable cases or to supplement operative removal. Results by X-ray therapy are so erratic and unpredictable that every removable growth of the larynx should be operated on; and until the results of X-ray or radium treatments are more consistent and encouraging, an operable new growth in the larynx should never be treated with irradiation alone. The other method is surgical removal, with an adequate margin to insure against recurrence. In very carefully selected cases, laryngofissure is the operation of choice. In all borderline cases where there is the slightest doubt about the extent of growth, the entire larynx should be removed. Cases for operation must be carefully selected. When growth

has invaded muscles, glands and cartilages, irradiation therapy only is used. If the anterior commissure is involved or the vocal cord is fixed, a laryngectomy is done.

Orton¹⁴ gives immediate and ultimate results in 102 operative cases. Etiology: Thirteen gave a history of heredity, 24 gave some history of chronic irritation. In the matter of age and sex, 91 were males, and 11 females; the youngest patient operated on was age 25 years, and the oldest, age 76 years. Excessive use of voice was noticed in 30; alcohol, as well as syphilis, played a minor rôle; 38, however, used tobacco to excess. In three cases there was a transition from papilloma to malignancy. Classification: Seventy-seven were intrinsic, and 25 were extrinsic; fifteen of the intrinsic were subglottic. In the movements of the cords the author found 30 with no interference at all; 25 had a right sluggish, and 14 a left sluggish cord; 19 had a right, and 14 a left fixed cord; so cords do not have to be sluggish or fixed to harbor cancer. Out of 102 operative cases, there are 77 successful, the patients living from one to 18 years. Early recognition and diagnosis of cancer of the larynx makes possible cure by surgical measures, laryngofissure, laryngectomy or lateral transthyroid pharyngotomy. He believes that laryngectomy is preferable to laryngofissure in subglottic cancer. He does not agree with those who say that laryngectomy is a mutilating operation, and in his experience laryngectomized patients have not been despondent; they have been a happy lot, getting a great deal out of life, as the following note from one of his laryngectomy patients will show:

"It's easy enough to smile
When you can talk and laugh and shout;
But those worth while
Are those who can smile
After their larynx has been cut out."

Sir St. Clair Thomson⁷⁰ states that subglottic cancer is much less frequent than either the intrinsic or the extrinsic forms. Early diagnosis is more difficult. Lesion is usually well advanced before it reaches the cords. The intermittent changes of voice may be the only early sign. He says that when the anterior commissure is invaded, a complete laryngectomy is indicated. The extent of the subglottic growth cannot be correctly judged until the larynx is out or split. If the general condition of the patient does not permit radical remov-

al of larynx, in other words, a poor surgical risk, irradiation should be used. It is difficult to decide when subglottic cases might be adequately dealt with through a laryngofissure, and when a more extensive operation, generally a complete laryngectomy.

Colledge⁷¹ says that the introduction of irradiation has rendered the problem of treatment in various situations infinitely more complicated, because the results of its use are neither so good that the method can claim to supplant simple surgical treatment altogether, nor so bad that they can be dismissed as negligible. For intrinsic laryngeal cancer, he uses either laryngofissure or laryngectomy. Those growths involving the lateral wall of the pharynx, the epiglottis, the aryepiglottic fold, and in postcricoid region may be treated by lateral pharyngotomy; pyriform sinus group by pharyngolaryngectomy. The classification of cases in these groups into those suitable for lateral pharyngotomy or for pharyngolaryngectomy and those which are inoperable must be decided by clinical experience, which takes into account the extent, degree of fixation of lymphatic glands, and general condition of patient.

Orton⁷² comments on cancer of the laryngopharynx, better known as extrinsic cancer of the larynx, which includes growth in the epiglottis, the aryepiglottic folds, the lateral and the posterior pharyngeal wall, the pyriform sinus and the postcricoid region. The area is not difficult to examine, nor is it difficult of access, yet it is surprising how far lesions have advanced before diagnosis is made. Symptoms depend on the site of lesion, usually beginning with some abnormal sensation; when a tickling sensation or constant clearing of the throat is persistent. He reports a case of melanosarcoma from the lateral wall of the pharynx, operated on by lateral trans-thyroid pharyngotomy, living four years after operation. Treatment of the lateral and the posterior pharyngeal type gives good results if the patient is seen early. Growths of the pyriform sinus and in the postcricoid region in the hypopharyngeal area have the poorest prognosis, although if they are seen at a very early stage, surgical intervention may be valuable. He quotes Trotter.^{72a} For the cases that formerly could be dealt with only by these heroic operations, to some extent we already have, and certainly in the future shall have, a much better resource in the expert, precise and enterprising use of radium. To those who do not begrudge the learning,

far exacting, technique and the risk of many disappointments, there is here a promising field for courage and ingenuity.

Rezzano⁷³ bases his study on 24 cases and notes the difficulty of early diagnosis. He says cancer of the pyriform sinus is a deceptive disease because of its obscurity, vagueness as to its symptoms. The treatment or therapeutic methods employed, radiosurgical — the surgical extirpation of the glands or even part of tumor, followed by irradiation, or the reverse. At present the author states we can only be sure of a palliative treatment of this disease. The only weapon we have is radiation, from which up to now we have not obtained very beneficial results.

Arons⁷⁴ points out that a survey of the literature does not permit any definite conclusions regarding the prognosis of cases of lymphosarcoma of the larynx, depending upon the extent of the lymphatic involvement at the onset of treatment. He believes that the protracted, fractionated treatment method is indicated, keeping the lethal dose within the lower limits of the range and delivering this dose within a period of three to four weeks. This results, at least, in palliation and the prolongation of life under comparatively comfortable circumstances.

Brunner⁷⁵ and Orton⁷² also report melanosarcoma of the laryngopharynx.

Toti⁷⁶ insists that the postoperative treatment is very important and must be carried out by a specially trained person.

Schall⁷⁷ engenders the fact that from the earliest writings to the most recent literature concerning cancer of the larynx, the operation of total laryngectomy is oftentimes described as a mutilating procedure, leaving its victim in a pitiable condition. Neither the public nor the vast majority of physicians are familiar with the patient who has lost his larynx and, consequently, normal speech. There is need of educating the medical profession, as well as the laity, to an understanding that the laryngectomized patient is not a pitiable object, a woe-begone creature who has given up all that life holds dear. The blind say they would rather be blind than deaf; the deaf, that they would rather be deaf than blind; the patient without a voice considers himself fortunate that he is neither blind nor deaf. In conclusion, he says that for the properly selected

patient, laryngectomy, when indicated, is not a prominent factor in precipitating the act of suicide or in causing mental derangement in the after-life if no previous psychopathic state has existed. Contact with a fairly large group of laryngectomized patients shows them to be a most optimistic, cheerful group, neither objects of curiosity nor, in most cases, recipients of charity. He cites Orton, who stated that no mental derangement has been suffered or any patient committed suicide in the 108 cases in which laryngectomy was performed.

Harris and Klemperer⁷⁸ state that primary malignant diseases of the larynx are for the most part carcinomas. The differentiation between radiosensitive and radioresistant tumors is based on their response to the action of Roentgen rays or radium. They report 32 patients with carcinoma of the larynx were treated with Roentgen rays according to the principles of Coutard. Biopsy material was studied histologically to determine criteria for pathologic differentiation of radiosensitive and radioresistant neoplasm. Grade of cellular differentiations, mitotic count, anaplasia of the cells, reaction in the stroma and location of the neoplasms were carefully considered, but no clear-cut criteria could be established. It is concluded that for protracted Roentgen therapy the histologic structure is of minor importance in determining the radio-resistance of laryngeal carcinoma.

The Berlin correspondent⁷⁹ to the *American Medical Association Journal* considers the application of radium in conjunction with laryngeal fenestration worthy of special study, both on account of its relative technical simplicity and because the results have thus far been favorable, especially with regard to restoration of laryngeal function. He mentions that Prof. A. Hermann, of Erfurt, recently discussed this procedure, and quotes him as saying that favorable outcome is predicted on careful selection of suitable cases. He points out that only unilateral circumscribed carcinomas that have not metastasized to any glands are suitable for this type of therapy.

Martin⁸⁰ states four facts are to be determined in treating malignancy: 1. The type of tumor. 2. The presence or absence of metastasis. 3. The site of tumor, considering the possibility of its removal surgically. 4. The type of treatment to be cho-

sen and the tumor's response to Roentgen ray or radium. In his series he found none suitable for laryngofissure.

Coutard⁸¹ points out that in the two extreme types of epithelioma of the larynx, the type formed of undifferentiated cells of mucous membrane type, and that of very differentiated cells of cutaneous type, the results are inverse. They are very good for the former; they are very poor for the latter. The one is very radiosensitive, easily curable; the other is little radiosensitive, rarely curable.

Martin⁸² states that irradiation therapy is the method of choice in all malignant tumors of the pharynx and larynx. He uses a modified Coutard method. The author states that his experience at this time has not extended over a five-year period. He concludes that irradiation should replace surgery in all borderline and inoperable cases.

Hamblen-Thomas⁸³ brings out the following points:
1. Operation should be done where possible. 2. All patients having irradiation treatment should be treated as in-patients. 3. Radium and X-ray, both have their particular uses. He believes that carcinomas arising in certain sites are especially sensitive to irradiation, as tonsil, soft palate and intrinsic cancer of the larynx. When there is firm fixation of growth with involvement of muscle and cartilaginous tissues, irradiation alone will not be successful. Glands present, the result of irradiation is not so good. Irradiation in combination with operation is good, but operation should be performed before the twenty-fifth day after irradiation. Intrinsic carcinoma of larynx and other growths involving the pharynx are unsuitable for interstitial irradiation. X-ray is the best treatment for very rapidly growing carcinoma.

Martin⁸⁴ states that the results of treatment of pharyngeal cancer have greatly improved since the introduction of protracted, or fractionated, Roentgen irradiation as developed by Coutard. The favorable results obtained in a certain percentage of cases have led to some over-enthusiasm for the method and to attempts at the cure of all forms of pharyngeal cancer by protracted irradiation alone. The exclusive use of Roentgen radiation in all cases is probably not the best solution of the problem of pharyngeal cancer. Interstitial irradiation with radon may be used to great advantage in combination with protracted Roentgen irradiation in many cases. A com-

bination of the two methods is of particular value for the treatment of an especially resistant portion of primary lesion or cervical node. The open mouth may be utilized as additional portal for the treatment of many intraoral lesions. Protracted irradiation with proper supplementary use of interstitial irradiation with radon was used in a considerable number of cases. Satisfactory information will be lacking until definite end-results are obtained from each anatomical form of cancer in the pharynx; that is, tonsil, nasopharynx and extrinsic.

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**THE INDICATION FOR SURGERY IN MENINGITIS
SECONDARY TO DISEASE OF THE MIDDLE
EAR AND OF THE NASAL SINUSES;
RESERVATIONS IN EARLY.
SURGICAL INTERVENTION.***

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I shall first consider meningitis, the acute fulminating type, occurring one to four days following the onset of an acute otitis media.

To incise an acute infected finger before Nature has had an opportunity to produce some walling off and localization of the invasion would be considered hasty and bad surgery. It is equally bad to incise, probe or express a furuncle of the nose before Nature has demonstrated signs of localization and suppuration. Here early incision not infrequently results in a cavernous sinus thrombosis and death.

To surgically invade the mastoid cells in an acute hyperemic stage is equally dangerous; tears down Nature's first walls of defense and further spreads infection. The shock of the anesthetic and operation may turn an early meningismus, or localized meningitis, into a diffuse suppurative affair. If a mallet and gouge are used, the concussion of the labyrinth with petechial hemorrhages can well be expected.

It is true that early intervention is imperative in an acutely inflamed appendix, but here the surgeon is able to remove the inflamed area in its entirety. This is not true, however, in acute ear infections; in fact, a mastoid operation does not even approach the most likely and frequent area of invasion, the epitympanic space. Again, a virulent infection may spread beyond the surgical field within a few hours or a day after the onset of an acute otitis media. I am convinced that a serious complication has never been warded off in a case of streptococci infection by premature surgical intervention.

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We commonly think of the eardrum constituting the entire lateral wall of the middle ear. This is not true, however, for the epitympanic space has a lateral wall of bone. The roof of this important space, the tegmen tympani, is traversed by the petrosquamosal suture, which is present until the age of 2 years, and occasionally persists in the adult.

This suture presents a direct communication between the dura of the middle fossa and the mucous membrane of the middle ear. In early life, the most frequent period of otitic meningitis, the petrosquamosal vein lies in the suture connecting the lateral sinus with the cavernous sinus.

Freisner has shown in his pathological specimens thrombosis and sepsis of the veins in the submucosa of the middle ear early in infection, even while the overlying epithelium is still intact.

Most acute fulminating otitis medias are streptococcic in origin, and streptococci have a predilection for veins. The pathologist, Andrew A. Eggston,¹ after an extensive study of the pathways of infection in suppurative meningitis, concludes that the venous circulation is the most important in the spread of infections to the cranial structures, with destruction of the endothelium of the venous channels.

There can be no extensions by way of the lymphatics from the middle ear or mastoid. Turner and Reynolds,² of London, have definitely shown that there is no continuity of the lymphatics between extracranial and intracranial structures.

Once the venules in the submucosa of the middle ear are attacked, the spread may be rapid to the meninges, with septic phlebitis of these small vessels. The thrombi then suppurate and rupture into the pia-arachnoid, and meningitis, or abscess, supervenes.

Dean and Wolff,³ Washington University School of Medicine, have demonstrated direct connections between the bone marrow and the submucosa of the middle ear in infants.

Marvin F. Jones,⁴ in a study of 384 case histories and a number of careful pathological sections, found that extension in meningitis occurred from the middle ear. "No convincing evidence was found indicating that the infected mastoid process acted as a focus for general infection."

I agree that old chronic infections, accompanied by cholesteatoma, and especially with small attic perforations, should be operated upon early in any acute exacerbation or evidence of meningeal irritation. I agree that an acute middle ear infection of seven to 10 days' duration or longer with meningeal symptoms can usually be operated with safety; however, the general clinical picture with the local findings and the very best clinical judgment must determine just when an acute otitis has reached the stage which justifies surgical attack.

Next to the tegmen tympani, the labyrinth probably offers the second most frequent avenue for extension of infections in acute middle ear diseases.

With a beginning labyrinthitis early operation only hastens the spread of infection.

An acute otitis media, mastoiditis and meningitis does not indicate an immediate mastoidectomy. The meningitis may have developed spontaneously with the middle ear and mastoid infection, quickly passing beyond the surgical field.

This rapid extension early beyond the surgical field also holds good in an acute nasal sinus infection and early meningitis. The sinus may be opened but the infection is already within the cranial cavity, and it now progresses independently of the original sinus invasion.

W. E. Clark,⁵ of London, demonstrated that ferric salts dropped into the nasal cavities of experimental animals reached the brain within an hour, apparently by way of the sheaths of the olfactory nerves.

Eagleton,⁶ after a study of 112 autopsies, concluded that if meningitis followed a "cold" and particularly in the absence of venous thrombosis, the sphenoid sinus was the chief offender. In such cases pneumococcus frequently was found in a culture of the blood.

Of the nasal sinuses the sphenoid sinuses rank first, and the ethmoid sinuses second in the production of meningitis. Patients who continue a low grade temperature after an acute nasal infection should be carefully examined for retention of pus in the sphenoid and ethmoid cavities. While an interne in general medicine I saw a young girl, age 16 years, who was observed as a possible typhoid. There was a history of an acute nasal infection preceding. Meningitis suddenly devel-

oped and autopsy revealed a sphenoid sinus completely filled with pus.

Many cases of otitis meningitis could be avoided by definitely clearing up by treatment, or surgery, chronic otitis medias, especially those with small attic perforations and cholesteatomas.

Acute nasal infections, with orbital cellulitis and meningitis, often occur almost simultaneously. To open the orbit and sinuses reveals no localization of pus and the infection has already passed into the cranial vault.

In conclusion, I wish to state that little is to be gained and much harm may result from premature surgical intervention of the mastoid and nasal sinuses before Nature has established some barrier, as demonstrated by the localization of pus.

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INTERNAL JUGULAR VEIN THROMBOSIS
SECONDARY TO LATERAL
PHARYNGEAL ABSCESS.
CASE REPORT.*

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Medical literature is replete with reports of unusual cases which stimulate one to further study.

Septicemia, from thrombosis of the internal jugular vein, following infection in or about the pharyngeal tonsils, occurs occasionally. The fact that it is not always recognized *in vivo* is evidenced by the number of cases diagnosed at autopsy. Cases hitherto labeled as postanginal sepsis are now known, as brought out by Mosher,¹ to be caused by infection of the deep cervical tissues from septic thrombi. Mosher emphasizes the pharyngomaxillary space as a common habitat for infection and the carotid sheath as the pathway. He calls the carotid sheath the Lincoln Highway of the neck, infection traveling along this route from the pharynx to the chest below, and to the skull above.

The case reported below is one of thrombosis of the internal jugular vein, with symptoms of septicemia, secondary to a lateral pharyngeal abscess.

Tracing the possible routes of infection from the pharynx to the internal jugular vein, Stone and Berger² mention the hematogenous. This would seem to be the probable course in this case. A retrograde thrombophlebitis beginning in the tonsillar veins spreads by way of the facial vein to the internal jugular.

Once the diagnosis is made, the therapy is surgical. The internal jugular vein must be exposed, and if it is found diseased it should be resected throughout its course. When this is done, most authorities advise that the sigmoid portion of the lateral sinus in the mastoid process should be explored. According to Porter,³ this exploration is indicated if "there

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is definite thickening of the vein or a thrombus obliterating the vein up to the jugular bulb." A like opinion is voiced by Stone and Berger. Of interest in the case reported below is the fact that the lateral sinus was not explored, although free bleeding was not obtained from the upper end of the vein when the diseased portion was resected.

Case Report: F. G., female, age $4\frac{1}{2}$ years, was admitted to my service at Morrisania City Hospital on March 24, 1938. She complained of pain in the right side of the neck. There was difficulty in swallowing and headache was present. These symptoms were of five days' duration. Since the onset of her illness there had been several elevations of temperature to 105° F.

The family history was irrelevant. The past history revealed a pyelitis at the age of 2 years. An adenotonsillectomy had been performed at the age of 3 years.

Physical examination showed a well developed, well nourished female child, 43 pounds in weight, looking acutely ill. There was no rigidity of the posterior neck muscles. Respiratory distress and trismus were absent. In the pharynx a fluctuant mass was noted on the right side, extending the length of the posterior pillar. The tonsil fossae were clean. Examination of the ears and nose was negative. There was a mass of tender glands just below the angle of the jaw, showing no evidence of being broken down.

Neurological examination revealed no abnormality in the deep or superficial reflexes. The lungs were clear. Examination of the abdomen gave negative results. The temperature was 103.8° F., respirations were 30.

A diagnosis of right lateral pharyngeal abscess was made. The fluctuant area was incised without anesthesia. A good deal of bleeding was encountered and a small amount of pus liberated.

The following morning the temperature was 101° F. It rose to 105° F. in the evening. A blood culture was taken and sulfanilamide, gr. xxx per day, in divided doses, by mouth, administered.

On March 26 the incision in the lateral pharyngeal wall was dilated with a hemostat. A small quantity of blood was

obtained; no pus was noted. On that day the patient had a chill lasting 20 minutes, with a subsequent rise of temperature to 107.6° F. A blood culture was taken at this time and specimens of urine ordered for examination every 12 hours, as pyelitis was considered an etiological possibility.

On March 27 the swelling in the pharynx had receded but the cervical adenitis was increased in severity. On that day the patient had a second chill and a rise of temperature to 109° F. A consultation was held with Dr. Louis H. Barenberg, Visiting Pediatrician. It was determined that we were dealing with a case of sepsis from phlebitis, or from a thrombophlebitis of the right internal jugular vein, secondary to the pharyngeal infection. Pyelitis was ruled out by the negative findings on urinalysis. Since there was no report from the two blood cultures previously taken, it was deemed advisable to defer surgical intervention and to push supportive measures.

Sulfanilamide was increased to gr. xl a day. A transfusion of 250 cc. citrated blood was given by the drip method. A spinal tap was performed. The lumbar puncture yielded crystal-clear fluid with an initial normal pressure of 160 mm. The Tobey-Ayer test was misleading, pressure over each internal jugular causing an equal rise in the spinal fluid pressure to 230 mm. In the light of the operative findings, this negative result was erroneous. The inconsistency was probably due to the crying and struggling of the child during the time the test was being made.

On March 28 the temperature was 99.8° F. in the morning and 104.2° F. at night. The patient's general condition seemed improved and the cervical adenitis was not any worse. A blood count showed 42,000 white cells, with 80 per cent polynuclears. The hemoglobin was 90 per cent, with 5,100,000 red cells. These findings were encouraging; however, the laboratory reported the first blood culture positive in broth media, but the organism was not identified.

On March 29, at 8:00 P.M., there was a third chill and a rise of temperature to 105.6° F. Another blood culture was taken and 200 cc. citrated blood were given.

On March 30, at noon, the blood cultures taken on March 25, 26 and 27 were all reported positive for hemolytic strep-

tococci. The culture taken on March 29 was later reported positive, but with a growth of Gram-positive diplococci, probably due to contamination. The highest temperature this day was 104° F.

Inspection of the internal jugular vein on the right side was decided upon.

Under general anesthesia an incision was made along the anterior border of the sternomastoid muscle from the angle of the mandible to the sternal notch. The skin, superficial fascia and platysma muscle were cut and the superficial layer of the deep fascia incised along the line of the skin incision. The sternomastoid was retracted posteriorly and the anterior belly of the omohyoid anteriorly. The carotid sheath was then identified by blunt dissection. While doing this, a gush of creamy pus welled up into the lower portion of the wound. Following this to its source, we found an abscess cavity around the great vessels, and the internal jugular vein was found to be thrombosed and necrotic. The vein was dissected free at the lowermost portion of the incision and ligated. Free bleeding came from this end. The thrombosed vessel was next freed in its course upward, all branches were tied and it was ligated above the entrance of the common facial trunk. The obliteration extended above this point as bleeding was not obtained here. An enlarged lymph gland was dissected free and removed from the upper portion of the wound. (In the writer's opinion the removal of inflamed glands surrounding the internal jugular vein should also be done when resection of the vein becomes necessary as a part of the attack upon lateral sinus thrombosis. This is to eliminate the possibility of subsequent annoying elevations of temperature.)

The wound was closed with buried catgut sutures and skin clips. A large size braided silkworm gut drain was inserted the length of the wound.

The postoperative course was uneventful. The temperature declined slowly and reached a constant level below 100° F. on the seventh day. Two more transfusions were given. The dosage of sulfanilamide gradually was reduced as the temperature leveled off. The drug was discontinued altogether, because of a slight macular rash, on the eighth day after operation. The drain was shortened each day. The patient

was discharged from the hospital on April 12, 1938, 13 days after her jugular resection.

It is noteworthy in this case that recovery took place without operating on the sigmoid portion of the lateral sinus. Many authorities think this step essential to recovery. Others advise the expectant attitude, after jugular resection, adopted by us.

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2940 Grand Concourse.

OBSERVATION ON BEHAVIOR OF LEUKOCYTES IN NASAL MUCUS. (PRELIMINARY REPORT.)

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A smear of nasal mucus, obtained fresh at the onset of an acute cold in the head (in the month of February, 1938), examined in the fresh unstained condition, revealed the surprising ameboid activity which we know about but seldom take the trouble to observe for ourselves.

Each field, studied with the oil immersion lens, showed no more than two or three cells. Wherever one cell happened to be situated in the vicinity of a second cell, the former exhibited very active motion toward the less mobile cell. As it approached a pseudopod was forming, and at the same time certain changes were taking place in the resting cell. Before the approach of the moving cell, the resting cell presented many dark (almost black in the silhouette of the dark field) granules within its protoplasm, quivering with their Brownian motion; but, as the moving cell neared, these granules seemed to arrange themselves around the periphery of the cell wall while the cell wall presenting toward the ameba-like pseudopod thinned out, and this pseudopod penetrated within the body of the receiving cell. Faint streamers of rays poured forth from the one cell through the pseudopod into the other cell. Finally larger aggregations of granular matter formed in the protoplasm of the receptive cell; and, as separation of the two cells followed, the cell wall closed in the one while the pseudopod grew smaller in the other as it moved promptly away on its errands.

EFFECT OF SILVER-NUCLEINATE ON LIVING LEUKOCYTES.

With the hope of bringing into stronger relief these active leukocytes, not having India ink at hand, it occurred to me to place a drop of Argo-nuclein (silver-nucleinate) solution at the edge of the coverslip. The nose was treated thoroughly with liberal drops of metaphedrin in oil (rotation of the head being used to bathe every portion of the nasal mucosa for its

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germicidal effects). To my sorrow, the approach of the brown wave of argo-nuclein immediately checked all movements of the leukocytes. Everything looked dead as in a stained preserved smear. Hoping to continue observation of the leukocytes, a fresh smear was at once made from the nasal mucus, but now again all movement was abolished, apparently by the metaphedrin preparation, of which oil globules were in evidence under the microscope.

The original coverslip smears were preserved, fixed and stained. Mucus containing scattered leukocytes was found—a far from interesting or novel preparation. Staining of the original smears, when hematoxylin and eosin was used, revealed more eosinophilic evidence than was anticipated.

A day or two later the nasal secretion had become more purulent in character, and smears examined in the same manner—fresh—revealed no activity in the numerous leukocytes observed except a single, almost pear-shaped, active cell, rotating upon its own axis, and waving a long beard-like tuft of hairs (cilia) now to right, now to left, very rapidly, the tuft of cilia flowing in a stream from right to left. Apparently this was a case of the tail wagging the dog (?).

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IONIZATION FOR THE CONTROL OF SEVERE HYPERTENSIVE EPISTAXIS.*

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Exclusive of direct and indirect traumatism, epistaxis is merely a symptom indicating underlying pathology. The etiology is quite variable and differs considerably in youth and age. Examples of this variability are the epistaxis of infancy and childhood which results from rickets and scurvy; the epistaxis of more mature years which results from the anemias and from infections such as typhoid fever; and the epistaxis of the later years of life, such as results from cardiovascular disease. The last-mentioned type is the subject of this paper.

It occurs not infrequently in the wards of a general hospital, and the uncertainty of its control with the usual methods is often quite exasperating. Because there is an accompanying high blood pressure the patient is almost always assured by the attending physicians that he or she was fortunate, in that the bleeding occurred in the nose and not in the brain. To be sure, there may be a goodly measure of truth in that statement, as the pressure does temporarily come down. It is in those cases where there are repeated bleedings at short intervals that a justifiable skepticism is aroused in the patient and also considerable anxiety. In such cases blood loss becomes excessive, leading to an anemia which cannot be disregarded, and this with very little, if any, reduction in blood pressure unless the patient lapses into a state of severe shock.

Anterior nasal packing with cotton or gauze, with or without some form of cauterization, is often effective, and there is no recurrence of the bleeding after removal of the packing. Many such cases, however, return with another hemorrhage after varying intervals of time and must again be packed and put to bed. Cauterization can be relied upon only if the bleeding point can be accurately located. When all this fails, post-nasal plug with intranasal packing is the usual procedure.

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Sometimes bleeding recurs after the packing and plug are removed, and it may be necessary to repeat the procedure. One of my cases returned to the hospital four times with severe epistaxis over a period of six years.

Some 20 years ago the writer devised an inflatable rubber bag for intranasal use. This was quite effective when the bleeding point was located on the septum in the lower half of the nose. A similar bag has been devised by Dr. R. W. Stevens, of Madison Wis.

When one can be certain that the bleeding is from a branch of the ethmoidal artery, ligation of this vessel on the orbital side of the os planum is a justifiable procedure. Ligation of the external carotid is obviously useless in such an instance. When the bleeding comes from a sphenopalatine branch it is very difficult and sometimes impossible to control it with packing of any kind. Ligation of the external carotid might prove to be the only means of control. In three cases where such a procedure has been under consideration I have succeeded in bringing about permanent cessation of the epistaxis by ionization, or iontophoresis, as has been employed for vasomotor rhinitis and hay fever. The first was done nearly three years ago, and there has been no epistaxis since in any of the cases. All three have a well marked arteriosclerosis. The certainty and permanency of its effect are its strongest recommendations. The thick fibrinous membrane of coagulative necrosis that immediately forms on the surface seems to act as a perfect blanket or cover and seals the leaking vessels. Whatever undesirable changes are produced in the mucous membrane may be considered the lesser of two evils, for control of the bleeding is the immediate necessity. The resulting submucosal fibrosis probably prevents repetitions of the bleeding. In all the cases packing had been inserted repeatedly in endeavoring to stop the bleeding.

Procedure: The packing which has been placed in the nose to control bleeding is removed a little at a time, and as the removal affords surface space cocaine and adrenalin solution is topically applied. It is also well to anesthetize the opposite side of the septum when only one side is involved. The ionizing pack and incorporated electrode are then introduced in the customary manner and the current applied. A current strength of 10 milliamperes for 10 minutes produces a good surface membrane.

In none of the three cases has there been the slightest bleeding after the removal of the ionizing pack. The after-treatment consists of deliberate noninterference, particularly while the pseudomembrane is still present. Sedatives or narcotics are usually necessary during the first 12 to 24 hours. After the membrane has come away one is justified in attempting very gently to prevent the formation of adhesions which tend to form at places where the space is very narrow. They do no particular harm.

Case 1: Mr. A., age about 65 years. *Past History:* Had been a college athlete in his youth and has led a very active life as a mining engineer. During his early engineering years had typhoid fever, which caused a severe phlebitis in one lower extremity and which has bothered him intermittently since. *Present History:* On Feb. 6, 1936, while at business in New York City he began to bleed from both sides of his nose, more from the right side. He immediately consulted a well known otolaryngologist, who cauterized several bleeding points with silver nitrate. He returned to his office and after business hours went to his home in a suburb. During the evening he began bleeding again and was unable to stop it. The general physician, also finding it impossible to stop it, brought him to the hospital at 3 A.M. I saw him there in the accident room, cauterized it again with silver nitrate, but could not be certain about the exact location of the bleeding points. There were several of these, both on the septum and in the ethmoid area on both sides. Vaseline gauze packing was inserted and the patient sent home. On the afternoon of that day, because of mild continued oozing, galvanocautery was applied and packing again inserted. It continued to ooze through the night, and the next day, Feb. 8, a postnasal plug with intranasal packing was inserted in both sides. This was left in place for 48 hours, during which time a slight oozing continued. The resulting blood loss anemia was not severe, as indicated by blood counts. The blood pressure after the bleeding was between 170 and 200. His family physician had, over a recent period of time, made readings of about the same figures. Urinalyses were negative. Both sides of the nose were narrowed at places where there were irregular deviations of the septum. It was felt that we were dealing with bleeding points which we could not see and that the bleeding would recur after removal of the plug and packing. After thinking

it over we decided to use ionization when the packing was removed. This was done, and there has been no epistaxis since. Healing was prompt and uneventful, despite the pre-existing trauma from cauterization and packing.

Case 2: Mrs. E., age 60 years. Past History: History of intranasal operation in another city years ago, during and after which there was prolonged excessive hemorrhage from the nose. Controlled with packing. This was an intranasal ethmoid operation with removal of polyps.

Present History: July 19, 1938: During recent months nasal breathing has become gradually obstructed, with reappearance of polyps in both sides. Nasal mucosa is markedly hyperplastic. Blood pressure, 208/110. Polyps were removed from both sides, and the ethmoid cells on left side exenterated. Anterior wall of left sphenoid removed. When the vaseline gauze packing was removed 48 hours later there was more than the ordinary amount of bleeding, which diminished and ceased over a period of one-half hour. There was some oozing during the night, and she was discharged from the hospital the following day not bleeding. Nine days later she was readmitted to the hospital because of recurrence of nasal hemorrhage the previous night, increasing in severity. Blood pressure, 184/100. Bleeding controlled temporarily with vaseline gauze. The next day ionization was done. After this there was no more bleeding.

Case 3: Mrs. P., age 47 years. Past History: During the past six years she had been admitted to the hospital four times for epistaxis and high blood pressure.

Present History: July 16, 1938: Admitted to hospital with nose packed for epistaxis. *Admission Notes (Dr. Meredith):* Patient has been a known hypertensive for a number of years and has been in the hospital several times, the last time Oct. 2, 1937. Since that time she has, on the whole, been quite well, with no shortness of breath, palpitation, headache, edema, etc. A few days before admission she first noticed slight bleeding from the left nostril. She was seen at home by her physician, who did not regard her condition as serious. Shortly before admission, however, the bleeding became more severe. Because of this the patient came to the accident room for treatment. There her blood pressure was found to be 240/150,

and she was admitted for observation. The patient states that about three weeks ago she had some pain in her right upper quadrant, which disappeared after a few days. Appetite and digestion good, bowels regular with occasional laxatives. Kidneys: night two-three times; day, five-six times. No dysuria. Periods ceased eight months ago. No leukorrhea.

Physical examination reveals a well developed, overweight, middle-aged Italian woman not acutely ill. Eyes: Pupils equal, regular, reaction slightly sluggish. Ears: Externally negative. Nose: Closed with packing. Teeth: A few missing. Several filled. Several cavities. Tongue: Normal. Tonsils: Small. Mucous Membrane: Slightly pale. Lungs: Clear. Heart: Somewhat enlarged. Regular systolic murmur over entire precordium, loudest at base. Rhythm regular. Abdomen: Some tenderness in right upper quadrant, otherwise negative. Extremities: Stasis dermatitis, right ankle. Varicose veins, right leg. Grating left knee. Upper extremities negative. Vaginal examination negative.

Impression: Hypertension. Enlarged heart. Epistaxis.
Notes: July 17: Yesterday the nasal packing was removed, but because of subsequent brisk bleeding a postnasal tampon and intranasal packing were introduced. Blood pressure 152/106. Patient continued to ooze through the packing and next day, July 18, the nose was ionized on both sides. Following this there was no more bleeding. On July 19 the blood pressure was 170/115. On July 26 the Roentgenologist reported the presence of cholelithiasis. Discharged from the hospital July 30. On Oct. 5 she reported at the clinic by request and stated that she was feeling exceptionally well. There were several adhesions in the left side of the nose, which was narrow because of the markedly deflected septum. Blood pictures:

	July 17	July 23
W.B.C.	10,000	6,000
R.B.C.	5,260,000	4,120,000
Hgb.	69%	69%
Polys.	61%	72%
Eos.	0%	1%
Bas.	0%	0%
Lymph.	36%	19%
Monos.	3%	7%
Young forms	0%	13%

COMMENTS.

1. Ionization avoids arterial ligations.
 2. It is conceivable that bleeding might recur after the establishment of the collateral circulation, following arterial ligation.
 3. Thus far there has been no recurrence of bleeding after ionization, presumably because of the fibrosis in the mucous membrane.
 4. The procedure could be repeated.
- 421 Huguenot Street.

ADAMANTINOMA OF THE SUPERIOR MAXILLA WITH INTRACRANIAL EXTENSION.

DR. SERGE ANDROP, Baltimore.

Adamantinoma is a tumor of the jaws, which from its histologic nature is considered to be derived from the enamel organ of the teeth. Although usually small, it may attain considerable size and distend the maxilla. Those that arise in the superior maxilla may invade the maxillary sinus and, rarely, extend intracranially.

A case of maxillary adamantinoma with intracranial invasion is here described; it appears to be the first such case described in America. We are not concerned, of course, with the primary adamantinoma that occurs in the supercellular region and which is of hypophyseal duct origin.

Report of Case: Mr. W. H. W., white, was admitted to the Ohio Hospital for Epileptics in 1913 at the age of 24 years. He had had grandmal epilepsy since the age of 1 year, accompanied by mental deterioration. In the second of two attempts at suicide, two months before admission, he fired a bullet into the right side of the forehead.

Although he made no complaint, a swelling of the left cheek was noticed on March 31, 1932, at the age of 43 years. A decayed left, first upper molar tooth was extracted. Immediately thereafter tissue began to extrude from the socket (see Fig. 1). It was evident that we were dealing with a neoplasm of the superior maxilla. On April 27 the left maxillary sinus was opened and considerable tumor tissue was removed. The resultant cavity was curetted and cauterized with a concentrated solution of phenol. Histologic preparations of the tumor were made; these will be described below. Although the patient complained of no pain or other symptoms, he steadily became weaker, his weight dropping from 150 to 92 pounds, and he died on July 19, 1932, three months after the tumor was discovered.

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Autopsy revealed multiple areas of tumor growth in the dura mater below, anterior to the frontal lobes, particularly on the left side (see Fig. 2). These were not attached to the brain. There was no tumor in the region of the third ventricle. The left lateral sinus was thrombosed and the cortical veins over the left temporal lobe and lower central region were distended. There was hemorrhagic necrosis of the left temporal lobe and mild suffusion of blood in the subarachnoid space over that side of the brain.

In addition, a flattened bullet was found on the external surface of the right frontal bone, with an underlying



Fig. 1. Photograph of the patient showing the tumor tissue extending through the socket of the left upper molar tooth.

skull defect measuring three-fourths of an inch in diameter. Beneath this the brain showed a puckered scar extending into the subcortex of the frontal lobe, where the dislodged fragment of bone was found.

Microscopic examination of the tumor removed at operation and of the dura mater was made by Dr. Horace B. Davidson, of Ohio State University. These closely resembled one another (see Fig. 3). They contained anastomosing strands of epithelial cells, the cells at the center were undifferentiated, while those at the margins resembled enameloblasts. Mitotic figures were occasionally seen. Between the strands was a fibrous

stroma, which was more abundant in the operative specimen. The dural tumors were quite vascular and contained a number of necrotic areas.

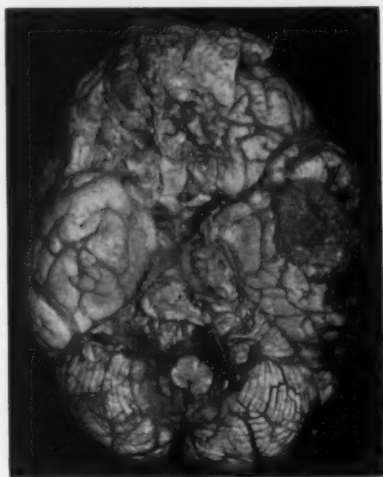


Fig. 2. Inferior surface of the brain, with neoplasms in the dura mater under the frontal lobes, softening of the left temporal lobe and mild sub-arachnoid hemorrhage.

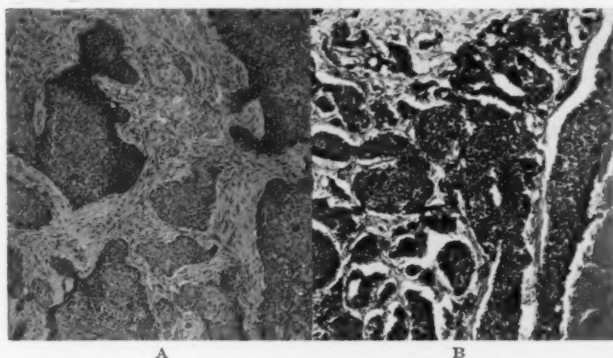


Fig. 3. Sections of tumor (A) removed at operation, and (B) of the dura mater at autopsy. Hematoxylin and eosin.

Histologic Diagnosis: Adamantinoma.

Comment: The histologic similarity of the maxillary tumor with that of the dura mater indicates that this is a case of

adamantinoma arising in the superior maxilla. Dissemination of the tumor occurred by direct extension into the maxillary sinus and intracranial cavity, involving the dura mater over the frontal lobes. The brain was not invaded. Thrombosis of the left lateral sinus caused hemorrhagic infarction of the temporal lobe and slight subarachnoid hemorrhage. As there was no anatomic connection of the tumor with the old bullet wound, it is evident that these conditions are unrelated.

SUMMARY.

A case is presented of a rapidly growing adamantinoma of the superior maxilla with invasion of the maxillary sinus and adjacent dura mater. Thrombosis of the lateral venous sinus occurred, with fatal termination.

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PROCAINE IDIOSYNCRASY AND CERVICAL PHLEG-
MON AS COMPLICATIONS FOLLOWING LOCAL
ANESTHESIA FOR TONSILLECTOMY.

CASE REPORT.

DR. H. D. HARLOWE, Virginia, Minn.

Complications following tonsillectomy are not infrequent or uncommon, but occasionally strange ones occur. Some of the less frequent complications are procaine idiosyncrasy and cervical phlegmon. Cases of procaine sensitivity following local tonsillectomy, with resulting fatalities, are reported by Mayer,¹ Henson,² Lillie³ and Snapp.⁴

From a review of the literature, Shapiro⁵ found only 80 cases of deep cervical infection following tonsillectomy. To this group he added 30 more cases. Hochfilzer⁶ later added one case. Hayden⁷ reported four additional cases, making a total of 115.

The following case is of special interest because it represents a combination of two comparatively rare complications following tonsillectomy.

REPORT OF CASE.

History: The patient, S. N., a white male, age 33 years, was first seen in October, 1937, at which time a diagnosis of chronic tonsillitis was made. A local tonsillectomy was advised, and 10 months later the patient returned for the operation. He received preoperative medications of sodium pentobarbital, gr. $1\frac{1}{2}$, by mouth, and one-half hour later he was given morphine sulphate, gr. $\frac{1}{4}$, with atropine sulphate, gr. 1/150. The tonsils were then injected in the usual manner with 0.5 per cent solution of procaine hydrochloride with epinephrine.

Shortly after the injection, the patient complained of faintness, severe headache, dyspnea and nausea. Immediately after, he became cyanotic, vomited and developed a rapid and

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weak pulse, and general clonic spasms set in. Following the administration of caffeine sodium benzoate, gr. $7\frac{1}{2}$, he gradually improved. The reaction following the procaine injection was so severe and prolonged that surgery was deemed inadvisable. He went home that evening apparently in satisfactory condition.

Six days later the patient was hospitalized by another physician. He stated that he had recently been injected for a local tonsillectomy, but had become so weak and faint that no operation was performed. He complained of severe pain and difficulty when opening his mouth, and of difficulty in breathing and swallowing. He also noticed a swelling on the left side of his neck. Temperature on admission was 37.5°C ., and on the following day reached 40°C .

Past and Family History: Irrelevant.

Physical Examination: Revealed a well developed, well nourished white male, weighing 205 pounds. A moderately firm, tender swelling which extended from the inferior border of the mandible to about the level of the hyoid bone and just anterior to the upper third of the sternocleidomastoid muscle was present on the left side of the neck. Examination of the pharynx disclosed a marked swelling in the left peritonsillar region. The left lateral pharyngeal wall and tonsil were displaced toward the midline. No point of fluctuation could be made out. Findings otherwise were normal. A tentative diagnosis of left cervical phlegmon was made.

Laboratory Findings: Hemoglobin, 95 per cent; red blood cells, 4,700,000; white blood cells, on admission, 13,000, and on the following day, 16,500. Urinalysis, Wassermann test and blood cultures were all negative. Bacteriological study of a smear from the throat revealed a mixed infection with streptococcus viridans predominating. No diphtheria bacilli were found.

Treatment and Course: During his stay in the hospital, the patient received sulfanilamide, warm throat irrigation, and hot, moist compresses externally applied to the affected side. Three days following admission, he was taken to the operating room for an incision and drainage of the abscess. Approximately 10 minutes after the injection of 1 per cent procaine hydrochloride solution with epinephrine, the patient expired

on the operating table. Artificial respiration and restorative measures were of no avail. No autopsy was held.

COMMENT.

Waldon⁸ states: "The phenomenon of hypersensitivity to procaine is of interest to anyone who employs that agent as a regional anesthetic. We know that man can exhibit hypersensitivity to such nonprotein substances as drugs as anesthetics. The capacity of an individual to become sensitive to protein substances is undoubtedly an inherited trait, but sensitivity to drugs and irritants that act by contact is acquired. Systemic reactions to the procaine group are fortunately rare; nevertheless, it is always wise to inquire of the patient regarding any idiosyncrasy to drugs in general before the administration of an anesthetic."

Hanson⁹ says: "The evidence seems to indicate that a few persons receiving local anesthesia will die, usually in convulsions. Within the range of therapeutic dosage this occurrence seems to be independent of the amount. The manner of death and the exaggerated reaction to small amounts suggest a mechanism similar to anaphylaxis."

Touhy¹⁰ replied concerning the case of S. N.: "We see not a few individuals during the year who are definitely sensitive to novocaine. When patients give a history of difficulty with local anesthetics, I would suggest that you use a simple skin test to determine for yourself the exact nature of the sensitivity. If the patient is sensitive to novocaine, within five minutes there should be a definite red flare around the site of the intradermal novocaine wheal. It has been my experience that patients who give a history of sensitivity to novocaine actually do not have novocaine sensitivity, but are recounting their subjective sensations, which are due to the epinephrine."

Authors differ in their opinion as to the etiology of cervical phlegmon following tonsillectomy.

Chamberlin¹¹ replied concerning this case: "I have had, years ago, three cases of deep cervical abscess following tonsillectomy. Subsequent to this experience, I have changed my technique of injecting and since then have had no recurrence. My theory, which, after all, is only a theory and cannot be substantiated, is that unless one is careful and happens to

transfix the tonsil with the needle, he carries infection on the end of the needle into the peritonsillar space, and this is the cause of the deep cervical abscess. There is a possibility that if you had removed the tonsils the abscess would not have occurred, although that is not entirely definite."

Shapiro⁵ believes that the most important factor in the cause of cervical phlegmon is the injection of infected material into the parapharyngeal space, and that contaminated solutions and instruments play an important part; however, four other patients on the same day were given identical portions of the same procaine solution without bad results.

Shapiro⁵ quoted Herman as of the opinion that deep cervical abscesses result from the activation of some latent process in the peritonsillar tissues following tonsillectomy, and Mathews as of the opinion that persons with lowered vitality are more susceptible to this complication.

Hochfilzer⁶ and Hayden⁷ are of the opinion that cervical phlegmon results from certain saprophytic bacteria becoming virulent following operation.

Wirth and Renno¹² believe that deep cervical abscesses result from unskillful local anesthesia, as injecting through infected tonsillar tissue into the parapharyngeal space. Claus¹³ agrees with Wirth and Renno,¹² and also believes that operating in the acute stage may be a possible etiological factor.

The work of Tumpeer and Levinson,¹⁴ Fisher and Gottdenker,¹⁵ Baj¹⁶ and Harrison¹⁷ tends to favor the opinion that following a local tonsillectomy a transitory bacteremia may arise. It is thus conceivable that in the presence of certain predisposing factors, an exacerbation of some latent foci may become activated and cervical phlegmon result.

SUMMARY AND CONCLUSIONS.

1. A case of procaine idiosyncrasy and cervical phlegmon as complications following local tonsillectomy is reported.
2. It is known that certain persons are sensitive to procaine hydrochloride.
3. There are on record cases of fatalities attributed to procaine idiosyncrasy.

4. The exact etiology of cervical phlegmon following throat surgery is still disputable.

5. No similar case was reported in a review of the literature.

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MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

SECTION ON OTOLARYNGOLOGY.

Meeting of Nov. 11, 1938.

(Continued from January issue.)

The Early Diagnosis and Treatment of Cancer of the Larynx. By Dr. Kenneth A. Phelps. (Continued.)

One may grade carcinomas of the larynx into three groups, viz., I, II and III, on the basis of the degree of differentiation, but the surgeon should base his treatment on the gross relations and not upon the microscopic structure of the tumor. He should not allow the degree of malignancy to influence his plan of treatment to any great degree. There is no conclusive evidence that the response to radiotherapy can be predicted from the histological structure of the tumor. A Grade I carcinoma may be so extensive that it cannot be removed locally, and a Grade III tumor may be localized at the time of operation. Carcinomas remain localized in the larynx for a long time. If local removal fails, there is usually still time to do a laryngectomy and save patient's life.

A precancerous lesion is one from which a cancer may develop; it is not an early stage of cancer. In the larynx the only definitely known precancerous lesion is a papilloma, but all papillomas do not become malignant.

DR. VIRGIL J. SCHWARTZ: It would be well to emphasize the fact that in properly selected cases at a favorable stage the prognosis is very good. Four of my last five cases of carcinoma of the larynx are living and well. One patient was operated when he was 78 and lived for almost ten years, when he died of natural causes. Occasionally, even if the tumor is rather far developed and if the posterior ends of the vocal cords are involved, it is still possible to save the patient's life. Several years ago I examined a patient with such involvement, and since he was a veteran, I referred him to the Veterans' Hospital in Minneapolis. Dr. Henry Hanson did a very good two-stage laryngectomy, and when I happened to be at the hospital recently I saw this patient, feeling perfectly well, aside from the fact that he had to use an artificial larynx.

Many people are becoming excessively cancer conscious. They come to the office with mild symptoms, convinced that they have carcinoma. Often it requires all the resourcefulness at our command to assure them that they do not have it. On the other hand, the persistent treatment of a case with a suspicious lesion by means of topical applications of silver and other medications may be disastrous because such valuable time may be lost during which a successful operation for malignancy could have been done.

Occasionally, some of these neoplasms are deceptive. A man recently came to the office with an ear complaint. During the course of the examination I inspected his pharynx, and found a large tumor on the left side of the tongue, near the left tonsillar fossa. It was of cauliflower appearance, about 1½ inches in diameter, largely of an outgrowing, rather than ingrowing type, but yet with a definitely firm center in the tongue. He had no throat symptoms of any kind. A doctor friend saw him with me and we agreed that clinically it was definitely of cancerous appearance. However, biopsies taken from various parts of the tumor brought the diagnosis of a benign lymphangioma and, as such, it would require no treatment unless symptoms develop, or the tumor spreads.

DR. HENRY V. HANSON: I am glad someone sees some early carcinomas of the larynx. With one exception, the cases I have seen have been quite late. The case Dr. Schwartz just mentioned came to him with laryngeal obstruction. When he was admitted to hospital at about 10 o'clock in the evening, he was exsanguinated, had air hunger and blue. A tracheotomy had to be done at once to allow him air and a laryngectomy done a few days later. He is well and happy after five years. The mental attitude of these patients is interesting. They are happy in the fact they have overcome a tremendous handicap in that they have learned to speak with an artificial larynx, which they are proud of. This man told me, before I had my operation I was just an ordinary fellow, but now I command the center of the stage wherever I go.

We can do a lot for these cases surgically, although the cases are well advanced and our percentages of cures is high by laryngectomy. The radiologists have great claims. However, I am unwilling to turn these cases over to the radiologist, for we have too many cases of cure by surgery, and so many of the cases I have seen where the treatment has been irradiation, the patient had stiffness, soreness, pain in treated areas, together with a fear complex, and one has an invalid on their hands.

One case we operated about nine months ago had involvement of epiglottis posterior commissure, base of the tongue and lateral pharyngeal wall. I saw him last week and he looks good. I am afraid he would not have had as good results with irradiation.

The patient is not always at fault in not getting early treatment, but they have been in the hands of physician and receiving gargles and, of late, sulphanilamide.

We have heard a great deal about the necessity of nose in preparing the inspired air for the lungs. One of our laryngectomized patients is working in the flour mills; although our mills are not as dusty as formerly, there is still considerable dust. After three years of working in the mills he has no subjective or objective evidence of any lung trouble.

DR. LAWRENCE R. BOIES: Someone should receive credit for getting these cases to Dr. Phelps early. My experience has not been as fortunate. For instance, in the past seven years I have seen 42 cases of malignant disease of the larynx at the University Hospital, and 12 cases in private practice. This makes a total of 54 cases. But in this whole group there were only 26 submitted to surgical treatment and the other 28 had malignant disease so extensive that they were considered beyond reasonable hope of surgical cure. Radium or X-ray therapy, or a combination of both, were used in most of these cases, but very few of them are now living. Of the 26 cases treated surgically, only two were considered proper cases for the simpler procedure of thyrotomy or laryngofissure. Several had hemilaryngectomies. To the best of my knowledge, at the present time 15 of the surgical cases are still living without evidence of recurrence. However, these cases have been seen within a seven-year period and most of them have not had a long enough postoperative interval to be certain of a cure.

It is interesting to note that in this same period in which 54 cases were studied, 34 cases of benign tumors of the larynx were seen.

We do not consider cancer of the pyriform sinus as a laryngeal cancer. No cases of this type are included in this group.

I believe Dr. Bell is rather generous in the proportion of females to males who have cancer of the larynx, in that he puts the ratio 6 to 1. I once received the records of 100 consecutive cases of cancer of the larynx coming to the Throat Department of the Massachusetts General Hospital. In this group there was only one case of cancer of the larynx in a female.

I once read a rather amusing paper listing the possible etiological factors in pharyngeal cancers in certain countries. It seems that in England, cancer

of the pharynx is more common than it is in this country, especially in males. The writer suggested that the drinking of so much hot tea was a factor in this instance. In China, it was noted that the incidence of pharyngeal cancer is more common in men than in women, and an explanation given for this is the fact that a great deal of hot rice is eaten and that the men sit down to eat first and are served by the women, and therefore, get the hotter rice.

DR. CYRUS O. HANSON (by invitation): Dr. Phelps asked me to discuss this subject as to the diagnosis and treatment by X-ray. From a diagnostic standpoint I do not feel that the X-ray is of great value except as confirmatory evidence. One can take soft tissue detail films of the larynx and frequently demonstrate tumors on the cords and growths that project out into the air passages and these shadows can frequently be intensified by a preliminary insufflation of the larynx with dry barium sulfate powder or iodized oil. For purposes of record these films are of some value, but they are not a substitute for direct observation and not a substitute for biopsy. By periodic films regression and spread can be recorded, but this usually is so obvious by direct examination that the use of the X-ray seems superfluous in most cases.

In regard to X-ray therapy, as Dr. Phelps has said, its use has been greatly influenced and stimulated by the work of Henri Coutard, formerly of the Radium Institute of Paris, and now residing in Chicago. He began his work in about 1923 and attempted to combine the histology and radiation effect in an attempt to work out a more satisfactory method of treatment. The result was the use of the prolonged fractional method of treatment which bears his name. Prior to his work the majority of radiologists attempted to give a series of X-ray treatments over a period of say four to ten days; he advocated the further division of this dosage and extension of the time over a period of 28, 35, 60, or even more, days. His use of this method and his courage in giving extremely large doses showed real promise in the radiological treatment of carcinoma of the larynx.

Anatomically carcinoma of the larynx is very favorably situated for X-ray treatment, the lesion is close to the surface and it is not necessary to penetrate through deep overlying structures to attack it, also there are no vital or extremely radiosensitive structures adjacent to it, with the exception of the laryngeal cartilages that interfere with the direct irradiation. The majority of the cancers are also of the squamous cell type and in common with other squamous cell carcinomas are radiosensitive. Strangely enough, the sensitivity to radiation follows the amenability to surgical treatment; namely, that the tumors located on the anterior and mid-portions of the cords are most sensitive and posteriorly they take on more the characteristics of carcinoma of the esophagus, which is notoriously radio-resistant. It also goes without saying that the smaller the lesion the better the chance for cure. Metastasis from these lesions is slow and follows the lymphatics, usually first to two small nodes just outside the larynx; however, the direct extension rather than metastases usually defeats the treatment. This fact has led in the newer methods of radiation to use smaller portals so that only the larynx and the immediate surroundings are subjected to the essential heavy dose.

I believe with Dr. Phelps that every case must be treated on its individual findings and that in the majority of the cases the combination of surgery with radiation is going to give the best results. I believe there are some cases that can be handled by X-ray alone as well as there are many cases that can be treated and cured by surgery alone, but in every case the whole therapeutic armament must be considered and carefully worked out as seems best for the carcinoma under consideration.

Radium must also be mentioned in the treatment of these tumors, and has been used in the form of external packs, radium element needles and radon implants. Dr. Douglas Quick of Memorial Hospital, is, I believe, the outstanding authority on the use of radium in this location and in a comprehensive article published in December, 1937, he leans somewhat away from

the use of radium and favors more the substitution of X-ray as the radiation factor in treatment.

The almost universal method of present day radiation consists then in the use of small daily doses of between 200 and 300 Roentgens until a total dosage of some 6,000 or more has been given and the period of treatment will be between 20 and 30 days. The criteria for stopping treatment are in addition to the attainment of the mathematically calculated dosage, the condition of the patient who, towards the end of the series, will complain of a dry, sore throat and sometimes a marked dysphagia, and the condition of the skin over the irradiated fields which will show a marked erythema that is just below the vesicular stage.

The use of these heavy doses is not without complications; the patient must be closely watched, as there is always the possibility of an edema of the larynx developing; the patient must be encouraged to take fluids, which may be difficult due to dysphagia, and it may even be necessary to give feedings and fluid through a tube. Late sequela can be stenosis of the larynx by scar tissue and there is also the danger of necrosis of the laryngeal cartilages. One must be very careful in giving further radiation even as late as several years after the initial series. Dr. Quick reports two cases at least where this was attended by very severe complications.

In the past two and one-half years we have seen seven cases, of which five are in the group Dr. Phelps reported. Three are known to be alive, one is under treatment at present, one is dead and two have not been heard from.

DR. KENNETH A. PHELPS: I want to thank the doctors for their excellent discussions. In fact, I think the order of the program should have been reversed—they should have presented the subject and I could probably have said something in discussion.

Re precancerous lesions. I had a case, age 70 years when he died, and to my knowledge he had a history of laryngeal papilloma for 40 years—died of a coronary. At autopsy the larynx was removed and there was no evidence of cancer. I will pass around the specimen. One question I would like to ask Dr. Cyrus Hanson: Will he elaborate a little concerning the value of the high voltage X-ray machines compared to those of the low voltage?

DR. CYRUS HANSON: There is no doubt that with the higher voltages it is possible to deliver an increased depth dose—that is, the proportion of radiation delivered at a depth beneath the skin in proportion to that delivered to the skin. The larynx is, however, not at any great depth under the surface and any improved results would largely then depend on an increased specificity of the shorter wave lengths produced by the higher voltages for tumor cells. The basis for this theory of greater specificity rests on the fact that many workers feel that the gamma rays from radium do have a greater inhibiting effect on cancer cells and if it is possible to generate X-rays at potentials of a million or more volts, the X-rays become of approximately the equivalent wave length of gamma rays. There is still much difference of opinion as to whether this specificity exists. Dr. Stone of San Francisco, who has had the opportunity to work with a million-volt machine for several years, does not support the theory; on the other hand, Dr. Schmitz of Chicago tells definitely there is an improved reaction. All of Dr. Coutard's work has been done at 200,000 volts, and most of Dr. Quick's series has been done at this level; these men both feel they are getting results from this type of equipment. Our own series has been done with our 400,000-volt machine.

Spontaneous Cerebrospinal Otorrhea. By Dr. Joel C. Hultkrans (by invitation).

Summary: A case of spontaneous cerebrospinal otorrhea was reported, in which trauma and infection played no part. The patient developed a pneumococcal meningitis, which was treated with large doses of sulfanilamide. The

end-result was recovery, with no further drainage from the ear and no residuals that might indicate cerebro damage.

The literature was reviewed critically and two cases with autopsy findings were found which resemble the case reported.

DISCUSSION.

DR. E. THOMAS BELL (by invitation): I think Dr. Hultkrans' patient owes her life to the prompt use of sulfanilamide.

An internist in a Boston Hospital recently stated that prior to the introduction of sulfanilamide he had seen 100 cases of pneumococcus meningitis with 100 per cent mortality. After starting sulfanilamide treatment he had seen ten cases with six recoveries. Sulfanilamide is very effective in pneumococcal meningitis.

On pathological grounds, I am inclined to think that the fistula in this case was on an inflammatory basis. Infection in the mastoid paves the way for an erosion into the subdural space. How else are we to explain the frequent development of meningitis in these cases?

Leukopenia has been reported occasionally after sulfanilamide therapy. Apparently this drug destroys the granulocytes in occasional susceptible individuals. There is a recent paper on this topic in the *Journal of the A. M. A.* Leukopenia is a very rare complication. The development of cyanosis does not warrant discontinuation of the treatment.

DR. LAWRENCE R. BOIS: I saw this case in consultation before the neurologists got hold of it. If my memory is correct, this patient did have evidence of chronic middle ear disease and the X-ray study of her mastoid showed necrosis.

At the time, I studied the reports in the literature and learned that most of these cases end fatally in meningitis. For that reason I recommended that the patient have close observation, with the possibility of a radical mastoidectomy in mind. This recommendation was made because it would seem possible in such a case to expose the site at which the spinal fluid leaks through the dura. It would seem reasonable that with proper exposure this leak could be controlled and with attention to local hygienic measures, a meningitis might be avoided. In a meningitis developing in a case like this, the focus of infection would seem to be in the middle ear. We know that in an ordinary case of threatened meningitis from middle ear or mastoid suppuration, adequate drainage is a very effective form of treatment.

The fact that the patient did get meningitis and did recover under sulfanilamide therapy without operation means, of course, that the therapy instituted was just as successful as any surgical procedure could have been insofar as her life was saved.

I would like to know what the condition of the middle ear and the hearing is at the present time. We can only speculate on the possibilities of recurrence of this disease.

DR. KARL C. WOLD: I would like to ask if there was any disturbance in the eye grounds or nystagmus in the case of Dr. Hultkrans.

DR. BERT G. LEVIN: I had a recent case of upper respiratory infection complicated by an inflammation of the central nervous system. Sulphanilamide was indicated and first used as injections of prontosil. There were two chills as a result. The consulting internist brought out the fact it is more effective in nervous system involvement as sulphanilamide by mouth.

DR. E. THOMAS BELL: Answering Dr. Levin's question as to whether sulfanilamide is more effective than prontosil, "Sulfanilamide is much to be preferred to prontosil. It is not necessary to inject the drug intraspinally."

DR. FRANK L. BRYANT: I should like to ask Dr. Hultkrans if the cerebro-spinal fluid could be spontaneous when there apparently existed a hole in the tympanic membrane. It seems there should have been in the history something significant to cause that hole or did spinal fluid gush out through tympanic membrane, which I believe was stated as normal.

DR. JOEL C. HULTKRANS: Dr. Boies asked if there was any evidence of middle ear disease, and about the hearing of the case at the present time, and also regarding the X-rays. Dr. Wold asked if there was any disturbance with the eye grounds or any nystagmus. Dr. Bell talked about the sulfanilamide treatment mostly.

In answer to Dr. Boies: "The patient showed very little, if any, reduction of hearing. Audiometer readings were practically normal. On otoscopic examination, there was no evidence of infection in this girl's ears. If Dr. Swendsen were here, he would emphasize that point. She only had watery fluid running from the ear."

In answer to Dr. Wold: "There was no objective findings. The eye grounds were negative and there was no nystagmus. There was only a draining ear."

In answer to Dr. Bell: "I purposely evaded the subject of sulfanilamide, as I thought that was an entirely different subject. Here we had a situation where we tried to group the organism and, although unsuccessful, it did not fall into any of the groups for which there is serum available, and knowing the condition to be 100 per cent fatal, we gave the patient 100 gr. the first day and the second day and then cut down, and she seemed to respond immediately."

In answer to Dr. Frank L. Bryant: "The patient had a history of middle ear infection at age 13 years. Examination showed she had an old ruptured ear drum. The length of time between the original infection and the time this occurred we thought was sufficient to rule out any connection between the infection and the drainage. If the ear drum had not been open, pressure would probably have ruptured it."

BOOK REVIEW.

Les Maladies de L'Oesophage. By J. Terracol, Professeur a la Faculte de Medicine de Montpellier, avec la collaboration de J. Baumel, S. Belinoff, P. Betoullieres, J. Delmas, G. Despons, F. G. Esman, H. L. Guibert, P. Guns, M. H. Harant, F. Haslinger, P. Larmarque, Mounier-Kuhn, A. Peroni, M. Sargonon, J. Vialle, M. Wisner and M. Worms. With 664 pages and 352 illustrations. Broche 190 fr. Cartonne toile 220 fr. Paris: Masson et Cie, Editeurs Libraires de L'Academie de Medicine, 120 Boulevard Saint-Germaine. 1938.

This octavo volume of 664 pages is divided into four parts.

The first part deals with the anatomy, both macroscopic and microscopic, physiology, X-ray studies of the normal viscus and esophagoscopy. Also accidents to this procedure, catheterization and biopsy.

Part two is devoted to the pathological conditions, such as congenital malformations, deviations, compressions, neuromuscular conditions, atony and paralysis, diverticulae, varicosities, acute and chronic esophagitis, peptic ulcer, pressure ulcerations, tuberculosis, syphilis, diphtheria, allergic conditions, agranulocytosis and parasites.

The third part of the volume deals with traumatic conditions, including ruptures, perforation, abscess, injection of corrosive substances, stenosis due to cicatrization, and tracheobronchial esophageal fistulae.

The fourth part deals with tumors, benign and malignant, foreign bodies and external surgery.

There is also a chapter on radiographic studies of pathological conditions; one on electrotherapy, and finally one on gastroscopy.

To deal with each chapter and each section thereof would necessitate quoting the text verbatim.

The anatomy and physiology is dealt with masterfully, and the illustrations are clear and self-explanatory.

Pathology is very carefully detailed in the text, and the line drawings showing the mechanism of the production of cardiospasm and pulsion diverticulum are illuminating.

The section on the etiology and pathology of traumatic esophagitis deserves careful study by all those doing any manipulation within the esophagus.

The illustration showing the method of retrograde dilatation is very helpful. The authors seemed to have missed the very excellent work of Gabriel Tucker, of Philadelphia, in this particular field.

Intubation is discussed and a method of application of radium, both internally and externally in cancer of the esophagus, is given careful consideration; however, 100 per cent failures have resulted.

Gastroscopy, using the Schindler flexible gastroscope, is a complete monograph in itself.

The bibliographies are very complete, and are placed at the end of each chapter.

The table of contents has been substituted for an index and placed in the back of the book. It is a rather complete table but can never take the place of a good index.

This is a most outstanding treatise on Diseases of the Esophagus. It is so well written that one with a small knowledge of French can get to the important details. The illustrations are such that they aid in this and greatly clarify the text, definitely proving the Chinese saying, "One good picture (illustration) equals many hundred words." This book should be in the library of all those doing work on the esophagus, and it is certainly a volume that will be used as a reference book for some time to come.

C. J. I.

